FIELD SAMPLING SUMMARY REPORT

PHASE I REMEDIAL INVESTIGATION
OPERABLE UNIT 3

LIBBY ASBESTOS SUPERFUND SITE

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LIST OF ACRONYMS

µm	micrometer
AOC	Administrative Order on Consent
BTOC	below top of casing
CCC	Civilian Conservation Corps
CDM	Camp Dresser McKee, Inc.
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminants of concern
DO	dissolved oxygen
ELI	Energy Laboratories, Inc.
EPA	U.S. Environmental Protection Agency
FD	field duplicate
FSDS	field sample data sheets
FSSR	Field Sampling Summary Report
GIS	geographic information system
GPS	global positioning system
HEPA	high-efficiency particulate air
Index ID	index identification
KDC	Kootenai Development Corporation
LA	Libby Amphibole
MDEQ	Montana Department of Environmental Quality
mL	milliliter
MSI	Meterological Solutions, Inc.
MWH	MWH Americas, Inc.
ORP	oxidation/reduction potential
OU	Operable Unit
PCB	polychlorinated biphenyls
PE	performance evaluation
PLM-VE	polarized light microscopy and visual estimation
PPE	personal protective equipment
QC	quality control

LIST OF ACRONYMS
(continued)

RI/FS	Remedial Investigation/Feasibility Study
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
SRC	Syracuse Research Corporation
SVOC	semi-volatile organic compound
TAL	target analyte list
TCL	target compound list
TEM	transmission electron microscopy
VOC	volatile organic compound

1.0 PROJECT OVERVIEW

1.1 BACKGROUND SUMMARY

The vermiculite deposit at Vermiculite Mountain, six miles northeast of Libby, Montana contains veins of asbestiform amphibole minerals (e.g., winchite, richterite and tremolite). The asbestiform amphibole minerals that occur at Vermiculite Mountain are collectively termed "Libby Amphibole" (LA) by the U.S. Environmental Protection Agency (EPA). Historic mining, milling, and processing of vermiculite from the former W.R. Grace mine at Vermiculite Mountain released LA fibers to the environment. Long-term inhalation of large quantities of LA fibers associated with the vermiculite is known to have caused adverse health effects in some workers at the mine and processing facilities and possibly in others in Libby.

In 2000, EPA began cleanup actions at Libby under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; also known as Superfund) to eliminate sources of LA exposure to residents and workers. Initial efforts were focused mainly on wastes remaining at former vermiculite processing areas. As work progressed, action shifted to cleanup of homes and workplaces in the residential/commercial areas of Libby, designated by EPA as Operable Unit 4 (OU4) of the Libby Asbestos Site.

As part of the Superfund designation of the Libby Asbestos Site, the former mine and environs at Vermiculite Mountain was designated OU3. In September 2007, EPA initiated a Remedial Investigation/Feasibility Study (RI/FS) of OU3 and produced the *Phase I Sampling and Analysis Plan for Operable Unit 3, Libby Asbestos Superfund Site* (SAP; EPA, 2007) to begin the characterization of environmental conditions at OU3. The OU3 Phase I SAP contains information on the history and operations of the former mine and discussions on general site geography, geology, hydrology and other relevant background information. The SAP also contains the preliminary sampling locations and the Standard Operating Procedures (SOPs) that were used as guidance during the OU3 Phase I RI performed in October 2007. This Field Sampling Summary Report (FSSR) is a summary of actual sampling locations and procedures and as such, detailed background information is not contained herein.

1.2 PURPOSE OF THE PHASE I REMEDIAL INVESTIGATION

Prior to implementing the OU3 Phase I RI in October 2007, EPA had collected limited information to evaluate any contaminants of potential concern at the former Vermiculite Mountain mine property and potential releases to adjacent forest lands, surface water and groundwater. Areas outside the former mine boundaries are of potential concern because they are used by the public for recreation, by logging companies for timber harvesting, and by wildlife as habitat. Contaminants of potential concern at OU3 include not only LA, but other mining-related contaminants that may have been released to the environment. The overall objective of sampling at OU3 is to collect sufficient information to allow evaluation of risks to humans and ecological receptors from exposure to mining-related releases, and to support the development and evaluation of remedial alternatives to address any unacceptable risks that are identified. This will occur over multiple, phased sampling events; the findings of each phase of sampling will be used to guide subsequent phases of investigation.

The Phase I sampling and analysis summarized in this FSSR is intended to provide initial information on the nature and extent of asbestiform LA and non-asbestos contamination, to identify contaminants of potential concern to be investigated during the RI, and to establish a study area boundary for Phase II of the RI. Phase I is not expected to provide data that will be sufficient to fully characterize the nature and extent of contamination or to support a risk assessment. Rather, the results of Phase I are intended to provide sufficient information that a more detailed and extensive sampling effort (Phase II) may be designed for implementation during the 2008 field season.

1.3 PURPOSE OF THIS DOCUMENT

This document is the FSSR for Phase I RI sampling of environmental media in support of the RI/FS at OU3 of the Libby Asbestos Superfund Site. OU3 includes the property at and around the former vermiculite mine at Vermiculite Mountain potentially impacted by releases and subsequent migration of hazardous substances from the mine site and former mine operations (the preliminary OU3 boundaries are depicted on each Plate in this document). The boundaries of OU3 had not been defined prior to Phase I RI field

sampling in October 2007; final boundaries for OU3 will be based primarily upon the extent of any contamination associated with releases from the former mine, as determined by analytical results for samples collected during Phase I and subsequent phases of the RI at OU3.

This FSSR is a summary of sampling activities, locations and methods employed during the Phase I RI at OU3. Analytical results for samples collected during the Phase I RI are not presented in this document. Because Phase I analytical results will be the basis for the data-gathering activities and scope of the Phase II RI at OU3, analytical data and interpretations will be presented as part of the OU3 Phase II Sampling and Analysis Plan (SAP), which is being prepared by EPA for implementation during the 2008 field season.

1.4 PROJECT ORGANIZATION

1.4.1 Project Management

EPA is the lead regulatory agency for Superfund activities within OU3. The EPA Remedial Project Manager (RPM) for OU3 is Bonita Lavelle of EPA Region 8. Ms. Lavelle is a principal data user and decision-maker for Superfund activities within OU3.

The Montana Department of Environmental Quality (MDEQ) is the support regulatory agency for Superfund activities within OU3. The MDEQ Project Manager for OU3 is Catherine LeCours. EPA consults with MDEQ as provided for by CERCLA, the National Contingency Plan, and applicable guidance in conducting Superfund activities at OU3.

EPA has entered into an Administrative Order on Consent (AOC) with Respondents W.R. Grace & Co.-Conn. and Kootenai Development Corporation (KDC). Under the terms of the AOC, the Respondents implemented the Phase I SAP at OU3. The designated Project Coordinator for the Respondents is Robert Medler of Remedium Group, Inc., a subsidiary of W.R. Grace & Co.

1.4.2 Technical Support

EPA was supported in this project by a number of contractors, including:

- Syracuse Research Corporation (SRC) assisted in the development of the Phase I SAP and will assist in the evaluation and interpretation of the Phase I analytical data.
- NewFields Boulder LLC, as a subcontractor to SRC, provided support in developing the SAP and with mapping and other GIS applications, and will assist in the design and evaluation of the feasibility study.
- U.S. Department of Transportation, John A. Volpe National Transportation
- Systems Center (Volpe) provided management and coordination of resources for field oversight of sampling activities.
- Camp Dresser McKee, Inc. (CDM) provided on-site support and oversight for field sampling activities.

1.4.3 Field Sampling Activities

Phase I field sampling activities were performed by W.R. Grace & Co.-Conn. and KDC with support from MWH Americas, Inc. (MWH) and Meterological Solutions, Inc. (MSI), in accordance with the Phase I SAP and field modifications authorized by EPA (see Attachment A of this FSSR). Individuals responsible for implementation of the OU3 Phase I field sampling program are listed below:

- MWH Project Manager/Field Supervisor: John Garr
- MWH Assistant PM/Field QC Officer: Jeremy Collyard
- MWH Quality Assurance Officer: Stephanie Boehnke
- MSI point-of-contact: William Hauze

1.4.4 EPA Field Oversight Contractor

Ms. Courtney Zamora of Volpe served as on-site point-of-contact for access to the former mine property; Ms. Zamora also coordinated field oversight and auditing for OU3 Phase I sampling. Oversight and auditing of Phase I field sampling was performed by CDM staff. Auditing forms are included in Attachment B of this FSSR.

1.4.5 Sample Preparation and Analysis

All samples collected as part of the OU3 Phase I RI were submitted to EPA-selected/approved laboratories for preparation and/or analysis.

- All sample analyses for LA are to be performed by EMSL Analytical, Inc.
- All sample analyses for non-asbestos analytes are to be performed by Energy Laboratories, Inc. (ELI)
- All soil or soil-like samples to be analyzed for non-volatile analytes are to be prepared by the EPA soil preparation facility in Troy, MT, before being submitted for analysis.
- All analytical data validation and verification is to be performed by SRC.

1.4.6 Data Management

Administration of the OU3 master database is performed by EPA contractors SRC and NewFields. The primary database administrator is Lynn Woodbury of SRC. She is responsible for sample tracking, uploading new data, performing error checks to identify inconsistent or missing data, and ensuring that all questionable data are checked and corrected as needed. When the OU3 database has been populated, checked and validated, relevant LA data from the Phase I RI will be transferred into the Libby2 database for final storage.

2.0 SUMMARY OF PHASE I RI SAMPLING OBJECTIVES

The objectives for OU3 Phase I Sampling and analysis were to provide preliminary information to address the following questions:

- What will be the study area for Phase II of the remedial investigation of OU3?
- What contaminants and what media will be investigated in Phase II of the remedial investigation of OU3? Which (if any) can be excluded?
- Of the various types of contamination within the mine area, which are likely to be the most important sources of release to other media?

To address these questions, media to be sampled and analyzed at OU3 were divided into the following classes, based on similarities in physical characteristics of the media, sampling methods, and analytes of interest:

- Soils and Mine Wastes
- Surface Water and Sediment
- Groundwater
- Tree Bark, Forest Floor Litter/Duff and Mineral Soil
- Ambient Air
- Biota

2.1 SOILS AND MINE WASTES

As is typical of most mining operations, large volumes of waste rock and tailings are present at various locations across the former W.R. Grace mine site at Vermiculite Mountain. Mine wastes may have also been used to construct roads throughout the mine site and are known to have been used in the construction of the tailings dam. To-date, few samples of these materials have been characterized to identify potentially hazardous constituents. Further, there is only limited information about the levels of LA associated

with the different types of mine wastes present at various locations across the mined area (i.e., waste piles, mine pits, impoundments, etc.). Therefore, the objective of mine waste sampling during Phase I was to collect and analyze samples from representative types of mine waste and soils at the mine site to identify environmental contaminants associated with the wastes and to identify source areas of potential concern.

2.2 SURFACE WATER AND SEDIMENTS

Historically, a limited number of surface water samples have been collected at OU3 and analyzed for a limited list of analytes. Most of the surface water quality data for non-asbestos contaminants was collected in the mid-1990s, thus, current surface water quality conditions are not known.

The objective of collecting additional surface water data during Phase I was to preliminarily characterize the nature and extent of surface water contamination related to historical mining, milling/processing, and mine-waste disposal operations. This objective was addressed by the collection and analysis of surface water samples from locations upstream and downstream of the mine, and in stream drainages that have been disturbed by past mining activities. In addition, the Phase I investigation included a visual survey to identify the locations of any springs or seeps where groundwater discharge is present and any seeps that issue from mine waste disposal areas.

In addition to surface water samples, sediment samples were collected during the Phase I RI and submitted for analysis to provide a preliminary characterization of the nature and extent of sediment contamination related to historical mining, ore processing and milling, and waste disposal operations.

2.3 GROUNDWATER

As part of the Phase I RI at OU3, six groundwater wells on record with W.R. Grace and the Montana Natural Resource Information – Groundwater Information Center were located and their conditions were evaluated. Because the wells have been inactive for an undetermined period, they will need to be re-developed before representative

groundwater samples can be collected. Well information collected during the Phase I RI will be used to plan needed well service and groundwater sampling during Phase II of the RI in 2008.

2.4 TREE BARK AND FOREST FLOOR

The objective of sampling and analyzing tree bark and forest floor samples from the forest lands that surround the mine was to determine if the extent and spatial distribution airborne LA fibers can be established. For such data to be useful, it was necessary that the samples provide adequate spatial coverage of the area around the mine, and that sufficient samples be collected to allow recognition of spatial patterns that may be present.

2.5 AMBIENT AIR

Ambient air at OU3 was sampled during the Phase I RI and submitted for LA fiber analysis to assess fiber releases from the mine site to adjacent downwind areas under current site conditions. Characterization of releases to ambient air included placement of eight stationary air monitors around the mined area to account for variations in wind speed and direction. Because the data needed for risk assessment purposes is an average concentration of LA fibers in ambient air, samples were collected over four intervals of five days each. Although only intended to be screening-level, air sample results from the Phase I program may be combined with results from subsequent phases of the OU3 RI to support risk assessment calculations.

2.6 BIOTA

Because biota sampling will be more effective if it is based on the type of data collected as part of the Phase I RI, EPA decided to defer biota sampling until a Biological Technical Assistance Group (BTAG) can be formed and Phase I data can be evaluated. After a BTAG has been formed to assist in problem formulation and sampling design, sampling and evaluation of aquatic and terrestrial organisms may be conducted as part of Phase II or subsequent phases of the RI at OU3.

3.0 MINE WASTE AND SOIL SAMPLING

3.1 SUMMARY OF MINE WASTE AND SOIL SAMPLING PROGRAM

Mine waste and soil samples collected during the Phase I RI included samples from each general class of materials that have been identified at the mine site to-date, including mine waste, surface soil in the former mill area, impounded tailings, coarse tailings, and samples of site materials that were used historically in the construction of unpaved sections of Rainy Creek Road.

3.1.1 Mine Waste and Surface Soil

Mine waste and surface soil samples were collected at each location specified in the SAP. Each sample was collected from within a three-foot-square area, and consisted of finer-grained materials (< ¼-inch) from the ground surface to a depth of six inches. Rocks larger than ¼-inch, organic matter and other debris items were manually removed from the samples. The locations of mine waste and surface soil samples collected during the Phase I RI are depicted on Plate 3-1.

3.1.2 Tailings

The tailings samples were collected at each location specified in the SAP. Each tailings sample was collected as a composite of eight sub-samples collected across a transect, as detailed in the SAP. Each sub-sample was collected from the surface to a depth of 12 inches. Plate 3-1 shows the locations of tailings samples collected during the Phase I RI.

3.1.3 Road Materials

The road materials samples were collected from unpaved portions of Rainy Creek Road, from each location specified in the SAP. The road materials sampled during the Phase I RI were collected from the surface to a depth of six inches. The locations of road materials samples are depicted on Plate 3-1.

3.2 ANALYSES

All mine waste and soil samples were submitted for analysis of LA fibers, CERCLA target analyte list (TAL) metals/metalloids, mercury, total organic carbon, paste pH, and fluoride and total phosphorous. Mine waste, tailings, soil from the former mill area and roadway materials were also collected and analyzed for petroleum hydrocarbons. Samples of Rainy Creek roadway materials were also analyzed for PCBs because oil was used historically for dust suppression on mine roads, and PCB oils are known to have been present at the mine. Samples collected from the fine tailings impoundment were submitted for analyses for a broader suite of potential contaminants, including organophosphate pesticides, chlorinated pesticides and herbicides. Table 3-1 is a summary of mine waste and soils samples collected during the Phase I RI; the table contains the sample identification, index identification, date and time of sample collection, sample type and requested analyses.

3.3 MINE WASTE AND SOIL SAMPLING EQUIPMENT, METHODS AND PROCEDURES

Mine waste, soil, and road materials samples were collected as discrete grab samples with dedicated steel trowels. Samples were collected from the surface to a depth of six or 12 inches, as specified in the SAP. Each grab sample was placed into appropriate containers, as required for the specified analyses. In accordance with the SAP, sampling personnel were careful to ensure that each sample contained material representative of the full specified interval.

3.3.1 Equipment

- GPS unit: Garmin Vista Hcx
- Site vehicle: Polaris 6x6 Ranger 2-passenger all-terrain vehicle
- Sample composition bowl: Stainless steel mixing bowl, dedicated to each sampling location

- Stainless steel trowel: Hand trowel with a stainless steel blade measuring approximately 6 inches in length. Trowels were dedicated to each sampling location
- Hammer: Estwing stainless steel rock hammer with vinyl handle
- Soil sampling device (for VOC and SVOC): EasyDraw Syringe and PowerStop handle, En Novative Technologies, Inc.
- Sample containers: Provided by analytical laboratories
- Plastic bags: Ziploc 1-gallon and 1-quart freezer bags
- Clear packaging tape: Scotch brand packaging tape
- Field logbook: "Rite in the Rain" all weather journal 390N
- Pens: "Rite in the Rain" all-weather pen #37, various indelible ballpoint pens, permanent markers
- Photo identification board: 12"x20" dry erase board with permanent team identification
- Camera: Nikon Coolpix L17 digital camera
- 2-way radios: Kenwood TK-380 800/900 mHz (FM band)

3.3.2 Location and Identification of Samples

All sample locations (with the exception of transect sample locations MS-04 through MS-09) had been established previously by CDM and marked with a wooden stake and flagging. The transect sample locations were defined by MWH prior to entering the site using ArcMap software. The GPS unit was held near the sample location for a short period of time to maximize accuracy and a waypoint was created. The coordinates were recorded on the field sample data sheet (FSDS) form along with the elevation and GPS accuracy. Details on the geographic information system (GIS) and global positioning system (GPS) used to locate and record sampling locations during the Phase I RI of OU3 are provided in Attachment C of this document.

3.3.3 Collection of Mine Waste Samples

Roadway samples were collected from the surface to a depth of six inches, using a dedicated steel trowel. A 3-foot-square area was cleared of surface debris for roadway sample locations. Roadway soil samples were placed directly into labeled sample containers and labeled Ziploc bags. The time of arrival, time of sample collection, sample location, and other observations were recorded on the FSDS form and the field logbook. The photo identification board was labeled with the date and time, sample location, project and team identification and held adjacent to the sample location to be photographed. Photographs are provided as JPG files in Appendix A (on CD in pocket at the back of this document).

3.3.4 Collection of Transect-Composite Mine Waste Samples

Transect sample locations MS-04 through MS-09 were defined by MWH prior to entering the site using ArcMap software following the guidelines in the SAP. Transect samples were composed of eight sub-sample sites located at the same elevation, as determined by GPS and visual estimation. The GPS unit was used to locate the individual sub-sample sites and to verify the elevation. Sample sites were identified alphabetically (e.g., MS-04a through MS-04g). Samples were collected using a dedicated stainless steel trowel and placed directly into plastic 1-quart Ziploc bags. A wooden stake and flagging identifying the sample site was placed at the location. Photos were not taken at every sub-composite sample point along the transect, rather, a photo was taken at the sub-composite sample point where the volatile organic compound (VOC) sample was collected. The photo identification board was labeled with the date and time, sample location, project and team identification and held adjacent to the sample location to be photographed.

3.3.5 Collection of VOC and SVOC Mine Waste Samples

Mine waste samples for VOC and semivolatile organic compound (SVOC) analyses were collected at two randomly chosen locations (MS04 and MS05). An EasyDraw Syringe sampling device fitted into a PowerStop handle was used to collect samples for VOC and

SVOC analyses. To minimize volatilization, these samples were collected immediately after clearing and sampling of the sample site. The sampling device was set to five grams, pressed into the undisturbed soil and slightly rotated. The device was then withdrawn from the soil and cleaned of any soil that adhered to the outside or extended beyond the tip of the syringe. The tip of the syringe was inserted into the preserved sample container and the soil plug was extruded into the sample container.

3.4 FIELD-BASED QUALITY CONTROL SAMPLES

3.4.1 Trip Blanks

During Phase I sampling, one trip blank accompanied each cooler of samples shipped to a laboratory for VOC, EPH or VPH analysis. Trip blanks were prepared by the laboratory and consisted of reagent-grade water in a 40-ml glass vial fitted with a Teflon septum and screw-top cap. Trip blanks associated with mine waste and soil samples are designated "TB" and are summarized on Table 3-1.

3.4.2 Field Duplicates

Within the mined area, one field duplicate was collected for each of the four types of solid media. The specific stations at which field duplicates were collected were randomly selected in the field. Field duplicates (designated "FD") associated with mine waste and soil samples are summarized on Table 3-1.

3.4.3 Performance Evaluation Samples

Performance evaluation (PE) samples were provided by EPA. The field sampling team did not open or otherwise disturb the PE samples, but simply affixed index identification labels to the sample containers and shipped the samples under chain-of-custody to the laboratories. PE samples associated with mine waste and soil samples are designated "PE" and summarized on Table 3-1.

3.5 SAMPLE HANDLING

3.5.1 Sample Containers, Preservation and Holding Times

All containers used for the collection of Phase I RI samples were prepared or supplied by the analytical laboratories, according to the procedures detailed in *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers* (EPA, 1992). Samples collected for analysis of VPH and target compound list (TCL) VOCs were preserved in the field with methanol, in accordance with EPA SW-846 Method 5035. Table 3-2 is a summary of sample containers, preservation methods and holding times for mine waste and soil samples collected during the Phase I RI.

3.6 SAMPLE DOCUMENTATION AND IDENTIFICATION

Data for each sample collected were documented on OU3 Phase I-specific FSDS. Any special circumstances that influenced sample collection or resulted in deviations from sampling SOPs were documented in a field logbook.

At the time of collection, each sample was assigned a unique 5-digit index identification (index ID) number. Sample IDs for all samples collected as part of the Phase I RI bear the prefix "P1" (e.g., P1-12345). Information on whether the sample is representative of a field sample or a field-based quality control (QC) sample (e.g., field blank or field duplicate) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was submitted "blind" to the analytical laboratory.

Each field sampling team maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in a field logbook. Scans of the mine waste and soil sampling logbook are provided as PDF files in Appendix A. Photographs of mine waste and soil sampling locations are provided as JPG files in Appendix A (on CD in pocket).

3.7 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

Chain-of-custody (COC) was maintained until final disposition of the samples by the laboratories and acceptance of analytical results. A COC form specific to the Phase I OU3 RI sampling program accompanied every shipment of samples to the analytical laboratories. All corrections to the COC record were initialed and dated by the person who made the corrections. Original COCs accompanied the samples to the laboratory. All samples sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Samples that required preparation at the sample preparation laboratory in Troy, Montana were transported there by MWH sampling personnel. Scans of mine waste and soil sampling COCs are provided as PDF files in Appendix F (on CD in pocket).

3.8 SAFETY

All MWH sampling personnel who entered the OU3 site were equipped with Level C personal protective equipment (PPE) consisting of two sets of hooded Tyvek coveralls worn over dedicated site clothing, full-face respirator, nitrile gloves and latex boot covers. Full-face respirators such as the North 7600 Series were worn with North P100 high-efficiency particulate air (HEPA) filter cartridges. Gloves were taped at the wrist to each Tyvek suit. Coveralls, gloves, boot covers and cartridges were disposed of after one use. The dedicated clothing was re-used until the project was completed, at which point it was discarded.

All equipment transported off site (coolers, shovels, etc.) was decontaminated at the on-site decontamination station by a site-experienced technician. All outbound vehicles that traveled beyond the decontamination station were decontaminated on site by a site-experienced technician. All sample containers and small equipment (GPS units, radios, etc.) were cleaned by field technicians at the MWH decontamination trailer.

TABLE 3-1

MINE WASTE AND SURFACE SOILS
SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 1 of 2)

Station ID	Matrix	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron	Mercury	Total Organic Carbon (TOC)	Paste pH	Fluoride and Total Phosphorus	Cyanide	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Organo-phosphate Pesticides	Chlorinated Pesticides	Herbicides	Polychlorinated Biphenyls (PCBs)	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Asbestos - LA PLM
MS-1	Roadway	P1-00370	N	10/11/2007	1115	X	X	X	X	X		X	X				X			X
	QC	P1-00374	TB	10/11/2007	1600							X								
MS-2	Roadway	P1-00371	N	10/11/2007	1145	X	X	X	X	X		X	X				X			X
	QC	P1-00374	TB	10/11/2007	1600							X								
MS-3	Roadway	P1-00372	N	10/11/2007	1215	X	X	X	X	X		X	X				X			X
	Roadway	P1-00373	FD	10/11/2007	1215	X	X	X	X	X		X	X				X			X
	QC	P1-00374	TB	10/11/2007	1600							X								
MS-4	Tailings	P1-00332	N	10/18/2007	900	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Tailings	P1-00333	FD	10/18/2007	900	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00359	TB	10/18/2007	1200							X						X		
MS-5	Tailings	P1-00357	N	10/17/2007	1030	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00358	TB	10/17/2007	1600							X						X		
MS-6	Tailings	P1-00355	N	10/16/2007	1035	X	X	X	X	X		X	X							X
	QC	P1-00331	TB	10/16/2007	1700							X								
MS-7	Tailings	P1-00294	N	10/16/2007	1255	X	X	X	X	X		X	X							X
	QC	P1-00331	TB	10/16/2007	1700							X								
MS-8	Tailings	P1-00330	N	10/16/2007	1420	X	X	X	X	X		X	X							X
	QC	P1-00331	TB	10/16/2007	1700							X								
MS-9	Tailings	P1-00356	N	10/16/2007	1305	X	X	X	X	X		X	X							X
	QC	P1-00331	TB	10/16/2007	1700							X								
MS-10	Waste Rock	P1-00366	N	10/12/2007	1035	X	X	X	X	X		X	X							X
	QC	P1-00387	TB	10/12/2007	1845							X								
MS-11	Waste Rock	P1-00367	N	10/12/2007	1100	X	X	X	X	X		X	X							X
	Waste Rock	P1-00368	FD	10/12/2007	1100	X	X	X	X	X		X	X							X
	QC	P1-00387	TB	10/12/2007	1845							X								
MS-12	Waste Rock	P1-00369	N	10/12/2007	1145	X	X	X	X	X		X	X							X
	QC	P1-00387	TB	10/12/2007	1845							X								
MS-13	Waste Rock	P1-00365	N	10/12/2007	1015	X	X	X	X	X		X	X							X
	QC	P1-00387	TB	10/12/2007	1845							X								
MS-14	Waste Rock	P1-00345	N	10/13/2007	1300	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-15	Waste Rock	P1-00206	N	10/17/2007	1140	X	X	X	X	X		X	X							X
	QC	P1-00339	TB	10/17/2007	830							X								
MS-16	Waste Rock	P1-00205	N	10/17/2007	1055	X	X	X	X	X		X	X							X
	QC	P1-00339	TB	10/17/2007	830							X								
MS-17	Waste Rock	P1-00343	N	10/13/2007	1210	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-18	Waste Rock	P1-00352	N	10/14/2007	1020	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1500							X								
MS-19	Waste Rock	P1-00341	N	10/13/2007	1115	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-20	Waste Rock	P1-00350	N	10/14/2007	920	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1400							X								

TABLE 3-1

MINE WASTE AND SURFACE SOILS
SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 2 of 2)

Station ID	Matrix	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron	Mercury	Total Organic Carbon (TOC)	Paste pH	Fluoride and Total Phosphorus	Cyanide	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Organo-phosphate Pesticides	Chlorinated Pesticides	Herbicides	Polychlorinated Biphenyls (PCBs)	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Asbestos - LA PLM
MS-21	Waste Rock	P1-00378	N	10/13/2007	930	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-22	Waste Rock	P1-00379	N	10/13/2007	950	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-23	Waste Rock	P1-00340	N	10/13/2007	1045	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-24	Waste Rock	P1-00353	N	10/18/2007	1050	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/18/2007	1400							X								
MS-25	Waste Rock	P1-00362	N	10/12/2007	1210	X	X	X	X	X										X
MS-26	Waste Rock	P1-00292	N	10/15/2007	1250	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
MS-27	Waste Rock	P1-00299	N	10/15/2007	1230	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
MS-28	Waste Rock	P1-00290	N	10/15/2007	1145	X	X	X	X	X		X	X							X
	Waste Rock	P1-00291	FD	10/15/2007	1145	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
MS-29	Waste Rock	P1-00298	N	10/15/2007	1115	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
MS-30	Waste Rock	P1-00342	N	10/13/2007	1140	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
MS-31	Waste Rock	P1-00389	N	10/13/2007	1030	X	X	X	X	X										X
MS-32	Waste Rock	P1-00351	N	10/14/2007	945	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1400							X								
MS-33	Waste Rock	P1-00364	N	10/12/2007	1540	X	X	X	X	X										X
MS-34	Waste Rock	P1-00344	N	10/13/2007	1235	X	X	X	X	X										X
MS-35	Waste Rock	P1-00363	N	10/12/2007	1220	X	X	X	X	X										X
MS-36	Waste Rock	P1-00375	N	10/12/2007	1620	X	X	X	X	X										X
MS-37	Waste Rock	P1-00376	N	10/12/2007	1640	X	X	X	X	X										X
MS-38	Waste Rock	P1-00377	N	10/12/2007	1655	X	X	X	X	X										X
DC-1	QC	P1-00295	PE	NA	NA												X			
	QC	P1-00296	PE	NA	NA	X	X													
	QC	P1-00297	PE	NA	NA														X	

N Field Sample
TB Trip Blank
FD Field Duplicate
QC Quality Control
PE Performance Evaluation
NA Not Applicable

TABLE 3-2

SAMPLE CONTAINERS, PRESERVATION METHODS AND HOLDING TIME REQUIREMENTS FOR MINE WASTE AND SURFACE SOIL SAMPLES

Container Description	Analyses	Method	Preservation and Handling	Extraction/Analysis Holding Times
8-oz glass jar	TAL Metals + Boron	EPA 6010/6020	Cool 4°C	180 days
	Mercury	EPA 7471A	Cool 4°C	28 days
	Total organic carbon (TOC)	EPA 9060/415.1	Cool 4°C protect from sunlight and atmospheric oxygen	28 days
	Paste pH	EPS 9045D/ ASAM10-3.2	Cool 4°C	14 days
	Fluoride	EPA 300.0/ SM4500-F-C	Cool 4°C	14 days
	Total phosphorus	EPA 365.1	Cool 4°C	28 days
	Cyanide	EPA 9012	Cool 4°C	14 days
10-mL glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Petroleum Hydrocarbons (VPH)	MADEP-VPH-04-1.1	Cool 4°C	28 days
4-oz wide-mouth amber glass jar with Teflon-lined screw cap	Extractable Petroleum Hydrocarbons (EPH)	MADEP-EPH-04-1	Cool 4°C	14 days
4-oz glass jar	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	14 days/40 days
8-oz glass jar	Chlorinated Pesticides	EPA 8081	Cool 4°C	14 days/40 days
	Herbicides	EPA 8151	Cool 4°C	14 days/40 days
	Polychlorinated Biphenyls (PCBs)	EPA 8082	Cool 4°C	14 days/40 days
10-mL glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Organic Compounds (VOCs)	EPA 8260B	Cool 4°C	14 days
4-oz amber glass jar with Teflon-lined screw cap	Semi-volatile Organic Compounds (SVOCs)	EPA 8270C	Cool 4°C	14 days/40 days
500 g in Ziploc bag (soil) or 1-L HDPE container (sediment)	Asbestos	PLM-Grav; SRC-LIBBY-01 (Rev.2) PLM-VE; SRC-LIBBY03 (Rev.2)	None	None
8-oz glass jar	(Archive sample)		Cool 4°C	--

(a) with Libby-specific modifications

4.0 SURFACE WATER AND SEDIMENT SAMPLING

4.1 SUMMARY OF SURFACE WATER AND SEDIMENT SAMPLING PROGRAM

Phase I RI surface water and sediment sampling was performed by separate two-person teams. Surface water and sediment samples were collected at 24 locations at OU3 (Plate 4-1). Surface water and sediment samples were collected at the following locations:

- The tailings impoundment and toe drains
- Mill Pond
- Rainy Creek, Fleetwood Creek, and Carney Creek upstream of mine-
- disturbed areas
- Fleetwood Creek and Carney Creek downstream of mine-disturbed areas
- Lower Rainy Creek below the Mill Pond and below Carney Creek
- Seeps and springs on or near the mined area

CDM established sampling locations during site reconnaissance prior to the start of the field sampling. In addition to marking the sample locations with labeled stakes, lath and surveyor's tape, CDM provided GPS coordinates that MWH entered into GPS units for use in finding the sample locations.

4.2 ANALYSES

4.2.1 Surface Water Analyses

All surface water samples were submitted for an extensive list of analyses, including:

- Libby amphibole (by transmission electron microscopy)
- TAL metals, boron and mercury (total)
- TAL metals, boron and hardness (dissolved)
- dissolved organic carbon
- nitrate, ammonia and Kjeldahl nitrogen
- orthophosphate
- volatile petroleum hydrocarbons (VPH)
- extractable petroleum hydrocarbons (EPH)
- fluoride/chloride/sulfate
- total suspended solids
- nitrite
- total dissolved solids
- alkalinity

A broader suite of analyses were requested for surface water samples collected from two locations: the tailings impoundment toe drain and Lower Rainy Creek downstream of its confluence with Carney Creek. In addition to the analytes listed above, surface water samples from these two locations also included polychlorinated biphenyls (PCBs), pesticides, herbicides, gross alpha/gross beta, volatile and semi-volatile organic compounds, and cyanide. Table 4-1 is a summary of surface water samples collected during the Phase I RI; the table contains the sample identification, index identification, date and time of sample collection, sample type and requested analyses.

4.2.2 Sediment Analyses

Sediment samples were submitted for the following analyses:

- Libby amphibole (by polarized light microscopy)
- TAL metals and boron
- mercury
- total organic carbon
- paste pH
- fluoride and total phosphorous
- VPH
- EPH

In addition to the analytes listed above, sediment samples from lower Rainy Creek downstream of its confluence with Carney Creek and from the tailings impoundment toe drain were also submitted for analysis for polychlorinated biphenyls (PCBs; to assess the potential effects of use of transformer oil for dust control along the adjacent road), cyanide, organophosphate pesticides, and volatile and semi-volatile organic compounds. Sediment samples at stations along lower Rainy Creek were also collected and submitted for analysis of pesticides and herbicides. Table 4-2 is a summary of sediment samples collected during the Phase I RI; the table contains the sample identification, index identification, date and time of sample collection, sample type and requested analyses.

4.3 SURFACE-WATER SAMPLING

4.3.1 Sample Collection

Stream water samples were collected from downstream to upstream stations to minimize the effect (e.g., increased turbidity) of sampling activities on the samples collected. All surface water samples from a single stream drainage were collected on the same day, to

minimize the influence of stream flow variations due to precipitation. Surface water samples were collected by pumping from the source through a peristaltic pump and directly into sample containers.

For the filtered samples (to be analyzed for metals only), water from the source was pumped through an in-line 0.45 micrometers (μm) high-capacity filter. Each new in-line filter was purged with approximately 200 milliliters (mL) of sample water before the sample container was filled. A new in-line filter and tubing was used at each sampling location to collect water for analyses of dissolved constituent concentrations. After the filtered samples were collected, the filter was removed, and unfiltered samples were collected.

To minimize volatilization, samples collected for VOC and SVOC analyses were not run through the drive cam on the peristaltic pump. Water was drawn into the uptake side of the Tygon tubing and held in the tubing by pinching the tubing and turning off the motor. The full tubing was then released, allowing the water to flow back out of the tubing and directly into the labeled sampling containers.

4.3.2 Equipment

- GPS Unit: Garmin Vista Hcx
- Site Vehicle: Kubota 4x4 RTV 2-passenger all-terrain vehicle
- Peristaltic Pump: Geotech Geopump peristaltic pump. Tygon and silicone tubing were dedicated to each sample location
- Field filter: Geotech 0.45-micron filter. Filters were dedicated to each sample location
- Water-quality meter: Hydrolab Quanta G multifunction water-quality system
- Tape measure: Retractable steel
- Flow rate device: Marsh Mcbirney 2000

- Flume: Global Water Instrumentation stainless steel Adjust-A-Flume (accurate to within 3%)
- Flow diversion/dam bags: Polyester fabric tubes filled with clean silica sand
- Level: Aluminum contrtactor's level
- Sample containers: Provided by the analytical laboratories
- Sample Storage: Plastic cooler containing ice in double-wrapped Ziploc bags.
- Clear packaging tape: Scotch brand packaging tape
- Field logbook: "Rite in the Rain" all weather journal 390N
- Pens: "Rite in the Rain" all weather pen #37, various ball point pens, and sharpie permanent markers
- Photo identification board: 12"x20" dry erase board with permanent team identification.
- Camera: Nikon Coolpix L17 digital camera
- 2-way radio: Kenwood TK-380 800/900 mHz (FM-band) radio

4.3.3 Identification of Pre-designated Surface Water Sampling Locations

The surface water sampling team used a GPS unit find the sampling locations established by CDM, which had been marked with a labeled wooden stake and surveyor's flagging. To confirm the locations and determine the actual coordinates of the sampling point, the GPS unit was held near the sample location for a short period of time to maximize accuracy and a waypoint was created. The GPS coordinates and elevation of each were recorded on the FSDS form or in the field logbook. Scans of the surface water sampling field logbook, FSDS and photographs of sampling locations are presented in Appendix B (on CD in pocket).

4.4 SEDIMENT SAMPLING

4.4.1 Sample Collection

One composite sediment sample was collected from each designated sediment sampling station. Each sediment sample consisted of a composite of five grab samples collected from low-energy (i.e., depositional) portions of the stream channel that were submerged at the time of sampling. The five grab samples were collected over a reach within 75 feet upstream or 75 feet downstream of the specified station.

To minimize channel disturbance and turbidity, the sediment sampling team collected at a particular sample location only after the surface water sampling team had collected the surface water sample. Samples were collected using a 500-ml swing sampler (a small polyethylene cup at the end of an extendable pole). Excess water was decanted from sediment collected in the swing sampler before it was transferred to a 1-gallon Ziploc bag for homogenizing and transfer into labeled sample containers. Sediment samples for VOC and SVOC analyses were collected from the homogenizing bag with an EasyDraw syringe sampler.

The sealed sample containers were immediately placed on ice for storage. The time of arrival, time of sample collection, sample location, and other data were recorded on FSDS forms and in the logbook. Sediment sampling logbook scans are contained in Appendix B (on CD in pocket). The photo identification board was labeled with the date and time, sample location and team identification and held near the sample location to be photographed (Appendix B on CD in pocket).

4.4.2 Equipment

- GPS Unit: Garmin Vista Hcx
- Site Vehicle: Kubota 4x4 RTV 2-passenger ATV

- Spoon: Stainless steel spoon
- Sampling device (for VOCs and SVOCs): EasyDraw Syringe sampler (manufactured by En Novative Technologies, Inc.)
- Tape measure: Retractable steel
- Supplied sample containers: Provided by analytical laboratories
- Sample storage: Plastic cooler containing ice in double wrapped ziplock bags.
- Clear packaging tape: Scotch brand packaging tape.
- Field logbook: "Rite in the Rain" all weather journal 390N
- Pens: "Rite in the Rain" all weather pen #37, various ball point pens, and sharpie permanent markers
- Photo identification board: 12"x20" dry erase board with permanent team identification.
- Camera: Nikon Coolpix L17 digital camera
- 2-way radios: Kenwood TK-380 800/900 mHz (FM-band)

4.5 IDENTIFICATION OF PRE-DESIGNATED SEDIMENT SAMPLING LOCATIONS

All surface water and sediment sampling locations were established by CDM with a labeled wooden stake and surveyor's flagging. The GPS unit was held near the sample location for a short period of time to maximize accuracy and a waypoint was created. The GPS coordinates, elevation and accuracy of each were recorded on the FSDS form.

4.6 FIELD DATA MEASUREMENTS

4.6.1 Water-Quality Parameters

The temperature, pH, specific conductance, dissolved oxygen (DO), oxidation/reduction

potential (ORP) and turbidity of surface waters sampled were measured in-stream with a portable integrated field meters and recorded on the FSDS. Table 4-3 is a summary of field-measured water-quality parameters measured during the Phase I RI at OU3.

4.6.2 Stream Flow Rate

At locations with flowing water, stream flow was measured using either an electronic flowmeter (for larger channels with simple cross-sections) or a portable flume (for smaller channels with low flow rates or irregular cross-sections). Table 4-4 is a summary of stream flow measurement data, calculated stream flow rates and method of flow rate measurement employed at each sampling location. Scans of the FSDS and field logbook for stream flow rate measurements are contained in Appendix B.

The portable flume was installed in the stream channel and leveled using a standard contractor's level. Sand bags were placed immediately upstream and to the sides of the flume to channel the stream into the flume. Sand bags were also placed at the sides of the flume as needed for stability. The flow was then determined by using the flow rate indicator marks on the inside of the flume.

In instances where the electronic stream flow sensor could be used, the sensor was lowered into the stream at a minimum of three cross-sectional points, at which the depth of the stream and the flow rate were observed and recorded. The width of the stream channel was recorded using a tape measure. The stream flow was then calculated using multiple flow observations and the width of the stream channel, in accordance with the area-velocity method. The sample location, time of arrival, time of flow measurement and other observations were recorded on the FSDS form and in the field logbook (see Appendix B).

4.7 FIELD-BASED QUALITY CONTROL SAMPLES

4.7.1 Blanks

Field Blanks Field blanks for water were prepared by placing an appropriate volume of laboratory-supplied reagent-grade water into a sample container. Field blanks for water were collected at a rate of at least 10% (1 field blank per 10 field samples, or 1 per sample batch, whichever was greater). Field blank samples collected as part of Phase I RI surface water sampling at OU3 are designated "FB" and summarized on Tables 4-1.

Trip Blanks During Phase I sampling, one laboratory-prepared trip blank accompanied each cooler of aqueous samples shipped to the laboratory for VOC analysis. One trip blank per cooler also accompanied sediment samples shipped for analysis of EPH and VPH. Field blank samples collected as part of Phase I RI surface water sampling at OU3 are designated "TB" and summarized on Table 4-1.

4.7.2 Duplicates

Field Duplicates The stations at which surface water and sediment field duplicates were collected were selected randomly in the field. Field blank samples collected as part of Phase I RI surface water and sediment sampling at OU3 are designated "FD" and are summarized on Table 4-1 and 4-2, respectively.

4.7.3 Performance Evaluation (PE) Samples

A total of four water PE samples and three soil PE samples containing a range of inorganic and organic analytes were added in random order to the field samples by the field collection teams. Field blank samples collected as part of Phase I RI surface water and sediment sampling at OU3 are designated "PE" and are summarized on Table 4-1 and 4-2, respectively.

4.8 SAMPLE HANDLING

4.8.1 Sample Containers

All containers used for the collection of Phase I RI samples were prepared and/or supplied by the analytical laboratories according to the procedures detailed in *Specifications and Guidance for Obtaining Contaminant-Free Sample Containers* (EPA, 1992). Tables 4-5 and 4-6 are summaries of containers used for surface water and sediment samples, respectively.

4.8.2 Sample Preservation and Storage

Sediment samples collected for analysis of VPH and TCL VOCs were preserved in the field with methanol, as specified by EPA SW-846 Method 5035 (see Table 4-6).

4.9 SAMPLE DOCUMENTATION AND IDENTIFICATION

Data regarding each sample collected were documented on OU3 Phase I RI-specific FSDS. Any special circumstances that influenced sample collection or resulted in deviations from sampling SOPs were documented in a field logbook.

At the time of collection, each sample was assigned a unique 5-digit index identification (index ID) number. Sample IDs for all samples collected as part of the Phase I RI bear the prefix of "P1" (e.g., P1-12345). Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was "blind" to the analytical laboratory.

Each field sampling team maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in the field logbook. Scans of the surface water and sediment sampling logbook are provided as PDF files in Appendix B. Photographs of surface water and sediment sampling locations are also contained in Appendix B.

4.10 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

Chain-of-custody (COC) was maintained until final disposition of the samples by the laboratories and acceptance of analytical results. A COC form specific to the Phase I OU3 RI sampling program accompanied every shipment of samples to the analytical laboratories. All corrections to the COC record were initialed and dated by the person who made the corrections. Original COCs accompanied the samples to the laboratory, and copies were made and retained to document each change of custody. All samples sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Samples that required preparation at the sample preparation laboratory in Troy, Montana were transported there by MWH sampling personnel. Scans of the surface water and sediment sample COCs are provided as PDF files in Appendix F.

4.11 SAFETY

All MWH sampling personnel who entered the OU3 site were equipped with Level C PPE consisting of two sets of hooded Tyvek coveralls worn over dedicated site clothing, full-face respirator, nitrile gloves and latex boot covers. Full-face respirators such as the North 7600 Series were worn with North P100 high-efficiency particulate air (HEPA) filter cartridges. Gloves were taped at the wrist to each Tyvek suit. Coveralls, gloves, boot covers and cartridges were disposed of after one use. The dedicated clothing was re-used until the project was completed, at which point it was discarded.

All equipment transported off site (coolers, shovels, etc.) was decontaminated at the on-site decontamination station by a site-experienced technician. All outbound vehicles that traveled beyond the decontamination station were decontaminated on site by a site-experienced technician. All sample containers and small equipment (GPS units, radios, etc.) were cleaned by field technicians at the MWH decontamination trailer.

TABLE 4-1

SURFACE WATER SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 1 of 2)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron (Total) + Mercury	TAL Metals + Boron (Dissolved), Hardness	Dissolved Organic Carbon (DOC)	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	Orthophosphate	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Fluoride/Chloride/ Sulfate	Total Suspended Solids (TSS)	Nitrite	Total Dissolved Solids (TDS)	Alkalinity	Organophosphate Pesticides	Chlorinated Pesticides	Polychlorinated Biphenyls (PCBs)	Herbicides	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Radiochemistry (gross alpha and gross beta)	Cyanide	Asbestos (LA - TEM - EPA 100.2 modified)
URC-1	Stream	P1-00391	N	10/14/2007	1045	X	X	X	X	X	X	X	X	X	X	X	X									X
	Stream	P1-00392	FD	10/14/2007	1050	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00394	TB	10/14/2007	1400						X															
URC-2	Stream	P1-00390	N	10/14/2007	915	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00393	TB	10/14/2007	1400						X															
LRC-1	Stream	P1-00304	N	10/15/2007	1345	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00310	TB	10/15/2007	1700						X															
LRC-2	Stream	P1-00251	N	10/15/2007	1230	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Stream	P1-00251	MS/MSD	10/15/2007	1230	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
	Stream	P1-00309	MS/MSD for	10/15/2007	1230																		X			
	Stream	P1-00252	FD	10/15/2007	1230	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00311	TB	10/15/2007	1700						X											X				
	Stream	P1-00257	FB	10/18/2007	900	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00413	TB	10/18/2007	1430						X											X				
LRC-3	Stream	P1-00303	N	10/15/2007	1145	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00307	TB	10/15/2007	1700						X															
LRC-4	Stream	P1-00302	N	10/15/2007	1100	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00308	TB	10/15/2007	1700						X															
LRC-5	Stream	P1-00301	N	10/15/2007	1030	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00305	TB	10/15/2007	1700						X															
LRC-6	Stream	P1-00300	N	10/15/2007	945	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00306	TB	10/15/2007	1700						X															
FC-1	Stream	P1-00267	N	10/13/2007	1130	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00273	TB	10/13/2007	1545						X															
FC-2	Stream	P1-00268	N	10/13/2007	1245	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00270	TB	10/13/2007	1545						X															
FC UPPER POND	Pond	P1-00266	N	10/13/2007	1115	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00271	TB	10/13/2007	1545						X															
TP	Pond	P1-00269	N	10/13/2007	1330	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00274	TB	10/13/2007	1545						X															
TP-TOE1	Stream	P1-00254	N	10/16/2007	1200	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00320	TB	10/16/2007	1600						X											X				
TP-TOE2	Stream	P1-00312	N	10/16/2007	1245	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00323	TB	10/16/2007	1600						X															

TABLE 4-1

SURFACE WATER SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 2 of 2)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron (Total) + Mercury	TAL Metals + Boron (Dissolved), Hardness	Dissolved Organic Carbon (DOC)	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	Orthophosphate	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Fluoride/Chloride/ Sulfate	Total Suspended Solids (TSS)	Nitrite	Total Dissolved Solids (TDS)	Alkalinity	Organophosphate Pesticides	Chlorinated Pesticides	Polychlorinated Biphenyls (PCBs)	Herbicides	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Radiochemistry (gross alpha and gross beta)	Cyanide	Asbestos (LA - TEM - EPA 100.2 modified)
MP	Pond	P1-00313	N	10/16/2007	1330	X	X	X	X	X	X	X	X	X	X	X	X									X
	Pond	P1-00314	FD	10/16/2007	1330	X	X	X	X	X	X	X	X	X	X	X	X									X
	QC	P1-00322	TB	10/16/2007	1600						X															
CC-1	Stream	P1-00381	N	10/11/2007	1215	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00360	TB	10/11/2007	1215						X															
CC-2	Stream	P1-00380	N	10/11/2007	1100	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00361	TB	10/11/2007	1100						X															
CCS-1	Seep	P1-00382	N	10/12/2007	1215	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00286	TB	10/12/2007	1900						X															
CCS-6	Seep	P1-00385	N	10/12/2007	930	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00288	TB	10/12/2007	1100						X															
CCS-8	Seep	P1-00317	N	10/17/2007	1145	X	X	X		X	X	X	X	X	X	X	X									X
	Seep	P1-00318	FB	10/17/2007	1145	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00410	TB	10/17/2007	1505						X															
CCS-9	Seep	P1-00315	N	10/16/2007	1100	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00321	TB	10/16/2007	1600						X															
CCS-11	Seep	P1-00383	N	10/12/2007	1530	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00285	TB	10/12/2007	1900						X															
CCS-14	Seep	P1-00265	N	10/13/2007	1000	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00272	TB	10/13/2007	1345						X															
CCS-16	Seep	P1-00316	N	10/17/2007	1015	X	X	X		X	X	X	X	X	X	X	X									X
	Seep	P1-00319	FB	10/17/2007	1015	X	X	X		X	X	X	X	X	X	X	X									X
	QC	P1-00411	TB	10/17/2007	1505						X															
DC-1	QC	P1-00412	PE	NA	NA	X													X	X		X				

N	Field Sample
FD	Field Duplicate
FB	Field Blank
TB	Trip Blank
PE	Performance Evaluation
QC	Quality Control
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Applicable

TABLE 4-2

SEDIMENT
SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 1 of 2)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron	Mercury	Total Organic Carbon (TOC)	Paste pH	Fluoride and Total Phosphorus	Cyanide	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Chlorinated Pesticides	Herbicides	Polychlorinated Biphenyls (PCBs)	Organophosphate Pesticides	Volatile Organic Compoundss (VOCs)	Semivolatile Organic Compounds (SVOCs)	Asbestos - LA PLM
URC-1	Stream	P1-00409	N	10/14/2007	1045	X	X	X	X	X		X	X							X
	Stream	P1-00347	FD	10/14/2007	1130	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1400							X								
URC-2	Stream	P1-00408	N	10/14/2007	1000	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1400							X								
LRC-1	Stream	P1-00338	N	10/17/2007	1225	X	X	X	X	X		X	X	X	X	X				X
	QC	P1-00339	TB	10/17/2007	830							X								
LRC-2	Stream	P1-00336	N	10/17/2007	945	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Stream	P1-00336	MS/MSD	10/17/2007	945	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
	Stream	P1-00337	FD	10/17/2007	1300	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00339	TB	10/17/2007	830							X						X		
LRC-3	Stream	P1-00335	N	10/16/2007	1505	X	X	X	X	X		X	X	X	X	X				X
	QC	P1-00331	TB	10/16/2007	1700							X								
LRC-4	Stream	P1-00329	N	10/16/2007	1440	X	X	X	X	X		X	X	X	X	X				X
	QC	P1-00331	TB	10/16/2007	1700							X								
LRC-5	Stream	P1-00328	N	10/16/2007	1410	X	X	X	X	X		X	X	X	X	X				X
	QC	P1-00331	TB	10/16/2007	1700							X								
LRC-6	Stream	P1-00327	N	10/16/2007	1340	X	X	X	X	X		X	X	X	X	X				X
	QC	P1-00331	TB	10/16/2007	1700							X								
FC-1	Stream	P1-00404	N	10/13/2007	1145	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
FC-2	Stream	P1-00406	N	10/13/2007	1250	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
FC UPPER POND	Pond	P1-00405	N	10/13/2007	1215	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
TP	Pond	P1-00407	N	10/14/2007	855	X	X	X	X	X		X	X							X
	QC	P1-00354	TB	10/14/2007	1400							X								
TP-TOE1	Stream	P1-00326	N	10/15/2007	1555	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
TP-TOE2	Stream	P1-00325	N	10/15/2007	1520	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	QC	P1-00293	TB	10/15/2007	1630							X						X		
MP	Pond	P1-00348	N	10/15/2007	1140	X	X	X	X	X		X	X							X
	Pond	P1-00349	FD	10/15/2007	1400	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								
CC-1	Stream	P1-00395	N	10/11/2007	1205	X	X	X	X	X		X	X							X
	QC	P1-00374	TB	10/11/2007	1600							X								
CC-2	Stream	P1-00399	N	10/12/2007	1620	X	X	X	X	X		X	X							X
	QC	P1-00401	TB	10/12/2007	1930							X								
CCS-1	Seep	P1-00396	N	10/12/2007	1000	X	X	X	X	X		X	X							X

TABLE 4-2

SEDIMENT
SUMMARY OF ANALYSES BY SAMPLING LOCATION
(Page 2 of 2)

Station ID	Station Type	Index ID	Sample Type	Sample Date	Sample Time	TAL Metals + Boron	Mercury	Total Organic Carbon (TOC)	Paste pH	Fluoride and Total Phosphorus	Cyanide	Volatile Petroleum Hydrocarbons (VPH)	Extractable Petroleum Hydrocarbons (EPH)	Chlorinated Pesticides	Herbicides	Polychlorinated Biphenyls (PCBs)	Organophosphate Pesticides	Volatile Organic Compoundss (VOCs)	Semivolatile Organic Compounds (SVOCs)	Asbestos - LA PLM
	QC	P1-00401	TB	10/12/2007	1930							X								
CCS-6	Seep	P1-00397	N	10/12/2007	1130	X	X	X	X	X		X	X							X
	QC	P1-00401	TB	10/12/2007	1930							X								
CCS-8	Seep	P1-00398	N	10/12/2007	1515	X	X	X	X	X		X	X							X
	QC	P1-00401	TB	10/12/2007	1930							X								
CCS-9	Seep	P1-00400	N	10/12/2007	1720	X	X	X	X	X		X	X							X
	Seep	P1-00400	FD	10/12/2007	1720	X	X	X	X	X		X	X							X
	QC	P1-00400	TB	10/12/2007	1930							X								
CCS-11	Seep	P1-00402	N	10/13/2007	945	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
CCS-14	Seep	P1-00403	N	10/13/2007	1030	X	X	X	X	X		X	X							X
	QC	P1-00346	TB	10/13/2007	1500							X								
CCS-16	Seep	P1-00289	N	10/15/2007	1040	X	X	X	X	X		X	X							X
	QC	P1-00293	TB	10/15/2007	1630							X								

N	Field Sample
FD	Field Duplicate
FB	Field Blank
TB	Trip Blank
MS	Matrix Spike
MSD	Matrix Spike Duplicate
QC	Quality Control

TABLE 4-3

SUMMARY OF FIELD PARAMETERS FOR SURFACE WATER BY SAMPLING LOCATION
(Page 1 of 1)

Station ID	Date	Time	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Oxidation/Reduction Potential (mV)
URC-1	10/14/2007	1045	4.68	8.46	0.377	12.21	4.2	295
URC-2	10/14/2007	915	3.89	8.43	0.402	37.72	6.8	278
LRC-1	10/15/2007	1345	8.93	9.73	0.520	12.10	3.6	262
LRC-2	10/15/2007	1235	7.85	8.68	0.522	11.52	3.2	310
LRC-3	10/15/2007	1145	6.18	8.71	0.573	9.69	4.5	297
LRC-4	10/15/2007	1100	5.04	8.72	0.573	12.37	4.7	319
LRC-5	10/15/2007	1030	4.79	8.83	0.570	13.34	3.7	332
LRC-6	10/15/2007	945	5.73	8.74	0.546	11.92	7.5	311
FC-1	10/13/2007	1130	6.5	8.76	11.170	10.65	8.5	287
FC-2	10/13/2007	1245	7.08	8.69	7.120	10.84	2.4	259
FC UPPER POND	10/13/2007	1115	9.34	8.8	0.295	11.70	37.2	263
TP	10/13/2007	1330	13.1	8.77	0.302	9.04	11.3	285
TP-TOE1	10/16/2007	1200	8.73	7.71	0.703	6.08	1.9	299
TP-TOE2	10/16/2007	1245	9.04	7.96	0.648	10.89	25.1	294
MP	10/16/2007	1330	8.73	8.05	0.526	9.94	60.5	312
CC-1	10/11/2007	1215	7.01	7.94	0.693	9.32	23.1	297
CC-2	10/11/2007	1100	7.81	6.67	0.715	9.06	2.1	337
CCS-1	10/12/2007	1247	8.77	8.23	0.746	8.28	225	266
CCS-6	10/12/2007	930	5.73	7.89	0.767	7.20	5999	1.92
CCS-8	10/17/2007	1145	7.27	8.2	0.750	8.84	2.5	292
CCS-9	10/16/2007	1100	8.39	8.16	0.746	24.05	3.8	323
CCS-11	10/12/2007	1530	8.78	8.09	0.654	11.51	12.7	1.06
CCS-14	10/13/2007	1000	7.12	8.41	0.590	30.50	24.1	283
CCS-16	10/17/2007	1015	7.44	8.04	0.904	30.79	6.4	188
DC-1	NA	NA	XX	XX	XX	XX	XX	XX

TABLE 4-4

SURFACE WATER
FLOW RECORD BY SAMPLING LOCATION
(Page 1 of 1)

Station ID	Date	Time	Flow (cubic ft/sec)	Flow (gal/min)	Flume	Area Velocity Method
URC-1	10/18/2007	1200	0.09	39.2	X	
URC-2	10/18/2007	1130	0.04*	20*	X	
LRC-1	10/18/2007	1215	0.41	184.02		X
LRC-2	10/18/2007	1155	0.5	224.42		X
LRC-3	10/18/2007	1133	0.76	341.11		X
LRC-4	10/18/2007	1112	0.34	152.60		X
LRC-5	10/18/2007	1050	0.63	282.76		X
LRC-6	10/18/2007	1044	0.41	184.02		X
FC-1	10/18/2007	1045	0.14	64.8	X	
FC-2	10/18/2007	1110	0	0	X	
FC UPPER POND	10/18/2007	1115	NA	NA		
TP	10/18/2007	1330	NA	NA		
TP-TOE1	10/18/2007	1220	0.29	132.2	X	
TP-TOE2	10/18/2007	1235	0.58	258.9	X	
MP	10/18/2007	1330	NA	NA		
CC-1	10/18/2007	1015	0.07	30.4	X	
CC-2	10/18/2007	1000	0.19	84.4	X	
CCS-1	10/18/2007	1247	NA	NA		
CCS-6	10/18/2007	930	NA	NA		
CCS-8	10/18/2007	1145	NA	NA		
CCS-9	10/18/2007	1100	NA	NA		
CCS-11	10/18/2007	1530	NA	NA		
CCS-14	10/18/2007	1000	NA	NA		
CCS-16	10/18/2007	1015	NA	NA		
DC-1	NA	NA	XX	XX	XX	XX

* Flow was observed at less than 0.19 gallons per minute with 5% leakage. After adjusting for leakage a value of 0.20 gallons per minute was estimated.

TABLE 4-5

SAMPLE CONTAINERS, PRESERVATION METHODS AND HOLDING TIME REQUIREMENTS FOR SURFACE WATER SAMPLES
(Page 1 of 1)

Container Description	Analyses	Method	Preservation and Handling	Extraction/Analysis Holding Times
205-mL plastic (pre-preserved with HNO_3)	TAL Metals+Boron (Total)	6010/6020 and EPA 200 series methods	Cool 4°C; HNO_3, pH<2	180 days
	Mercury	7470A/ EPA245.1	Cool 4°C	28 days
250-mL plastic filtration	TAL Metals+Boron (Dissolved), Hardness	6010/6020 and EPA 200 series methods	Cool 4°C; HNO_3 (preserve sample in field after filtering)	180 days
1-L amber glass	Dissolved Organic Carbon (DOC)	9060/ EPA 415.1	Cool 4°C; H_3PO_4 (preserve sample in field after filtering)	28 days
500-mL plastic (pre-preserved with H_2SO_4)	Nitrate, Ammonia, Total Kjeldahl Nitrogen (TKN)	EPA 353.2, 350.1/350.2, 351.2	Cool 4°C; H_2SO_4, pH<2	28 days
	Orthophosphate	EPA 365.2	Cool 4°C; H_2SO_4, pH<2	28 days
3 x 40-mL amber glass vial with Teflon-lined screw cap (pre-preserved with HCl)	Volatile Petroleum Hydrocarbons (VPH)	MA-DEP VPH modified	HCl to pH<2 Cool 4°C	14 days
2 x 1-L amber glass bottle with Teflon-lined screw cap (pre-preserved with H_2SO_4)	Extractable Petroleum Hydrocarbons (EPH)	MA-DEP EPH modified	H_2SO_4 to pH <2, Cool 4°C	14/40 days
1-L plastic	Fluoride, Chloride, Sulfate	EPA 300.0	Cool 4°C	28 days
	Total Suspended Solids (TSS)	Standard Methods 2540D	Cool 4°C	7 days
	Nitrite	EPA 353.2	Cool 4°C	48 hours
	Total Dissolved Solids (TDS)	Standard Methods 2540C	Cool 4°C	7 days
	Alkalinity	Standard Methods 2320B	Cool 4°C	14 days
2 x 1-L amber glass	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	40 days
2 x 1-L amber glass	Chlorinated Pesticides	EPA 8081	Cool 4°C	7 days/40 days
	Polychlorinated Biphenyls (PCBs)	EPA 8082	Cool 4°C	7 days/40 days
2 x 1-L amber glass	Herbicides	EPA 8151	Cool 4°C	7 days/40 days
2 x 1-L amber glass	Semi-volatile Organic Compounds (SVOCs)	EPA 8270C	Cool 4°C	7 days/40 days
3 x 40 mL vials; no headspace (pre-preserved with HCl)	Volatile Organic Comounds (VOCs)	EPA 8260B	Cool 4°C; HCl pH<2	14 days
1-L plastic (pre-preserved with HNO_3)	Radiochemistry (gross alpha and gross beta)	EPA 900.0	Cool 4°C; HNO_3	None
	Radium, Uranium	EPA 900.3, EPA 200 series	Cool 4°C; HNO_3	180 days
500-mL plastic (pre-preserved with NaOH)	Cyanide	EPA 335.4	Cool 4°C; NaOH, pH>12	14 days
1 L HDPE container	Asbestos	EPA 100.2 modified (a)	Cool 4°C	Filtered within 48 hours

(a) with Libby-specific modifications

TABLE 4-6

SAMPLE CONTAINERS, PRESERVATION METHODS AND HOLDING TIME REQUIREMENTS FOR SEDIMENT SAMPLES
(Page 1 of 1)

Container Description	Analyses	Method	Preservation and Handling	Extraction/Analysis Holding Times
8-oz glass jar	TAL Metals + Boron	EPA 6010/6020	Cool 4°C	180 days
	Mercury	EPA 7471A	Cool 4°C	28 days
	Total organic carbon (TOC)	EPA 9060/415.1	Cool 4°C protect from sunlight and atmospheric oxygen	28 days
	Paste pH	EPS 9045D/ ASAM10-3.2	Cool 4°C	14 days
	Fluoride	EPA 300.0/ SM4500-F-C	Cool 4°C	14 days
	Total phosphorus	EPA 365.1	Cool 4°C	28 days
	Cyanide	EPA 9012	Cool 4°C	14 days
10-mL glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Petroleum Hydrocarbons (VPH)	MADEP-VPH-04-1.1	Cool 4°C	28 days
4-oz wide-mouth amber glass jar with Teflon-lined screw cap	Extractable Petroleum Hydrocarbons (EPH)	MADEP-EPH-04-1	Cool 4°C	14 days
4-oz glass jar	Organophosphate Pesticides (OPP)	EPA 8141	Cool 4°C	14 days/40 days
8-oz glass jar	Chlorinated Pesticides	EPA 8081	Cool 4°C	14 days/40 days
	Herbicides	EPA 8151	Cool 4°C	14 days/40 days
	Polychlorinated Biphenyls (PCBs)	EPA 8082	Cool 4°C	14 days/40 days
10-mL glass vial with Teflon-lined screw cap (pre-preserved with methanol)	Volatile Organic Compounds (VOCs)	EPA 8260B	Cool 4°C	14 days
4-oz amber glass jar with Teflon-lined screw cap	Semi-volatile Organic Compounds (SVOCs)	EPA 8270C	Cool 4°C	14 days/40 days
500 g in Ziploc bag (soil) or 1-L HDPE container (sediment)	Asbestos	PLM-Grav; SRC-LIBBY-01 (Rev.2) PLM-VE; SRC-LIBBY03 (Rev.2)	None	None
8-oz glass jar	(Archive sample)		Cool 4°C	--

(a) with Libby-specific modifications

5.0 GROUNDWATER

On October 14, 2007 MWH personnel located and examined six groundwater wells on or near the mine site at OU3 to evaluate whether the wells could be used for collection of groundwater samples during the Phase I RI. Observations made at each of the well locations are summarized in the following subsections. Table 5-1 is a summary of the well location coordinates, water levels, well depths and other details; Plate 5-1 shows the well locations. For the purpose of discussion, the six wells are designated herein as wells "A" through "F."

5.1 WELL A

According to information provided by long-time Libby residents, this well was installed by or for the Civilian Conservation Corps (CCC). The well is located next to the remnants of a log cabin, in the bottom of the Carney Creek drainage, upstream of the pond at the base of the fine tailings pile, about 2,500 feet east and upstream from Rainy Creek. It is a white-painted 6-inch-diameter steel pipe with about 10 inches of stickup, open at the surface. Local residents have obsereved this well to flow under confined ("artesian") conditions, although it was not flowing at the time it was located and inspected on October 14, 2007. The static water elevation was 5.35 feet below top of casing (BTOC). The total depth was sounded at 41.42 feet BTOC, but the bottom was very soft, which may indicate the well is silted-in, or that only an obstruction was tagged. If water samples are to be taken from this well, it must first be developed by surging and bailing to ensure that any debris is cleared from the well.

5.2 WELL B

Well B is located in an open grassy area about 200 feet downstream from the Mill Pond. It is an 8-inch-diameter steel well with about 2 feet of stickup. There is a removable cap on the top of the casing. There are two brass plates on the outside of the casing, each about 2 inches wide and 1 inch high. One plate has "WR Grace 87-12-35-0256" stamped on it, the other has the same, but the final four digits are "0257." There is a 1.5-inch diameter steel riser pipe inside the 8-inch casing. The riser pipe has a lifting eye threaded

onto the top. Three electrical wires (red/yellow/black) extend out the top of the casing. This well has been plugged and abandoned by filling the annulus between the riser pipe and the casing with cement to within about 5 feet BTOC. The riser pipe is cemented to within 7.5 feet BTOC. Because this well has been plugged and abandoned, it cannot be sampled.

5.3 WELL C

Well C is in an open grassy area about 1,000 feet downstream from the tailings dam. The well casing is 10-inch-diameter steel with about 2 feet of stickup. The top of the well is a clamped steel plate, which may be a pump hanger. A 3-inch-diameter pipe extends through the steel plate, and a threaded ell rests on the plate. Three electrical wires (red/yellow/black) extend out the top of the casing. A short length of 3-inch pipe is threaded into and extends horizontally from the ell, and appears to have been cut off with a torch. The water level indicator probe was passed through the ell and into the riser pipe to measure the water level (26.07 feet BTOC) and the bottom (or top of pump) at 74.27 feet BTOC. We did not attempt to remove the clamp because the setup appeared to be a pump hanger from which the pump is suspended. A well-service rig would be needed to open this well and remove the pump before the water could be sampled. Because the age and condition of the pump is not known, the pump should be removed and assessed before samples are collected.

5.4 WELL D

Well D is housed inside a 10-foot-square, 8-foot-tall, light green, metal shed-roof building on a 10-inch-thick concrete slab. The 10-inch-diameter steel well casing is set within a 5-foot-diameter corrugated galvanized culvert pipe that extends about 2 feet above the concrete slab floor. The bottom of the culvert is about 8 feet below grade. The well head is capped with a bolted flange, through which the pump wiring and a depth-sounding port penetrate. The total depth of the well was sounded ast 341.56 feet BTOC, and the static water level was 247.54 feet BTOC. The remnants of a chlorination system (consisting of a peristaltic pump cam head and flexible tubing) are inside the building, and indicate the well was used as a potable water supply. The building contains a great

amount of rodent droppings and the culvert is a confined space. Before a sample could be taken from this well, a well service company should be contracted to open the wellhead, remove and assess the condition of the pump, and surge/bail the well.

5.5 WELL E

Well E is a 2-inch-diameter PVC monitoring well inside a 6-inch steel protective surface casing. The surface casing is covered by a lockable cast aluminum cap, but was not locked. The top of the PVC casing is about 28 inches above grade and was sealed with a PVC slip cap, which is marked "MW-1." The total depth of the well was tagged at 255.31 feet BTOC. The static water level was measured at 80.28 feet BTOC. The bottom was soft, which suggests there is silt or debris in the bottom of the well. Before a sample can be collected from this well, it should be redeveloped by surging/bailing to remove any debris or sediment.

5.6 WELL F

This well is a 2-inch-diameter PVC monitoring well with no protective casing. The top of the casing is cut off at an angle of about 30 degrees from horizontal. The ground surface around the well is collapsed to a depth of about 2 feet, probably due to settling of bentonite or cement grout emplaced in the annular space between the casing and the wellbore. The well was found to be uncapped, open to the surface, with no identification markings. The total depth of the well was measured at 216.29 feet. BTOC. The bottom was hard, and the depth to water was only about six inches above the bottom, which suggests that the well may have a silt trap that is filled with condensate or precipitation, and that the well screeen does not reach the groundwater table.

5.7 SUMMARY OF RECOMMENDATIONS FOR WELL SAMPLING AT OU3

Three of the six wells known to be present at OU3 have pumps remaining in them (Wells B, C and D, Plate 5-1); one of these wells (Well B) has been plugged and abandoned with the pump in-place, and cannot be sampled. Of the three OU3 wells wells without pumps, two are 2-inch diameter monitoring wells; one of these (Well F) seems not to be

completed in groundwater, the other (Well E) is completed in groundwater, but appears to have debris or silt in the bottom. The "CCC Well" (Well A) was discovered by following directions provided by a local contractor with knowledge of the mine site.

Samples representative of current groundwater quality cannot be collected from the known wells at OU3 until the wells have been serviced and worked over (cleaned and re-developed) by a licensed well service contractor. Because access to several of the wells will need to be improved before they can be reached by a service rig, groundwater sampling should be postponed until a subsequent phase of investigation (potentially, in the spring of 2008). This will allow time for further research of the history and construction details of the wells, to allow roads to the well locations to be built or improved, and to locate and contract with a qualified well service contractor. Careful and thorough preparation will ensure that the water samples are more representative of actual aquifer conditions, and will yield data of the highest possible quality.

TABLE 5-1

LIBBY ASBESTOS SUPERFUND SITE OU3 WELL SUMMARY
(Page 1 of 1)

Well I.D.	Location Description	Northing	Easting	Elev. (m AMSL)	Horiz. Acc. (+/- feet)	Well Diam. (in.)	Material	TD (ft. BTOC)	SWL (ft. BTOC)	One Casing Volume	Status
A	"CCC Well" in Carney Creek drainage, upstream of pond below fine tailings	617269	5364977	1032	10	6	Steel	41.42	5.35	53 gal.	open, no cap
B	In grassy area downstream from Amphitheater	615832	5365772	829	9	8	Steel	unk	unk	na - P&A	P&A, pump in place
C	In clearing across small creek south of tailings dam, upstream of watergate	616243	5366266	848	9	10	Steel	74.27 (pump top?)	26.07	197 gal.	plate cap, pump in place
D	In pumphouse above (east of) tailings pond dam, potable supply well	617150	5365992	1176	9	10	Steel	341.56	247.54	384 gal.	flanged plate, conf. space
E	"MW-1" just off road on broad top level, ESE of pumphouse	617426	5365832	1181	9	2	PVC	255.31	80.28	28.5 gal.	unsecured, slip cap
F	2-inch PVC well on edge of slope above (north of) Carney Cr.	617016	5365427	1149	9	2	PVC	216.29	215.9	na - dry	unsecured, open

6.0 TREE BARK AND FOREST FLOOR SAMPLING

6.1 SUMMARY OF TREE BARK AND FOREST FLOOR SAMPLING PROGRAM

To provide data for spatial pattern analysis of LA fibers retained on tree bark and on the forest floor in lands adjacent to the Vermiculite Mountain mine site, samples of tree bark, forest floor litter and duff, and mineral soil were collected from 74 locations along transects centered on the former mine, with emphasis on the predominant downwind direction (northeast). Plate 6-1 shows the actual locations from which tree bark and forest floor samples were collected during Phase I sampling. In a few instances, the preliminary sample locations specified in the SAP had to be adjusted in the field, based on local conditions and features (particularly accessibility and the presence of Douglas fir trees of suitable size).

6.2 ANALYSES

6.2.1 Tree Bark

Tree bark samples will be analyzed for fibrous LA using a method similar to that developed by Ward, et al. (2006). The EPA/EMSL SOP (Rev. 1) for Tree Bark Analysis is a modification of the Ward procedure.

6.2.2 Forest Floor Litter and Duff

Organic debris from the forest floor will be prepared by ashing, and the residue will be prepared for examination by transmission electron microscopy (TEM). The mass of each LA particle will be estimated from its dimensions, and the results will be expressed in terms of mass of LA per unit weight of organic debris. This will allow the results to be combined with those of the corresponding soil sample, analyzed by polarized light microscopy and visual estimation (PLM-VE).

6.2.3 Mineral Soil

Mineral soil samples collected from the tree bark/forest floor sampling locations will be analyzed for asbestos by PLM. The coarse-fraction soil aliquot (if any) will be examined using stereomicroscopy, and any particles of asbestos (as confirmed by PLM) will be removed and weighed. One of the fine-ground fraction aliquots will be analyzed by PLM-VE using Libby-specific reference materials.

6.3 SAMPLING EQUIPMENT, METHODS AND PROCEDURES

6.3.1 Equipment

- Diameter tape measure: Spencer 35-foot Pro D-Tape. The D-Tape has diameter in inches and tenths on one side of the tape (allows directly converted diameter measurement, based on circumference), and distance in feet, inches and tenths on the opposite side
- Compass: Brunton 9020G compass with adjustable declination
- Bark sample fixative: Aquanet extra hold hairspray
- Electric drill: Black and Decker 12V battery powered rechargeable
- Drill bit: 2-inch diameter hole saw with ¼-inch pilot bit. The ¼-inch pilot bit and the 2-inch diameter hole saw were dedicated to individual sample sites. The arbor is a non-contact part of the drill assembly and was wiped clean of sawdust between sampling locations
- Bark sample removal tool: Stainless steel paint can top remover. This tool was dedicated to individual sampling locations
- Stainless steel trowel: Hand trowel with a stainless steel blade measuring approximately six inches in length. Trowels were dedicated to individual sampling locations
- Hammer: Estwing stainless steel rock hammer with vinyl handle

- Increment borer: 16" 3-thread Haglof increment borer
- Plastic bags: Ziploc 1-gallon (forest floor litter/duff), 1-quart (soil), 1-pint (tree bark) freezer bags
- Clear packaging tape: Scotch brand packaging tape
- Tree core sample storage containers: McDonalds drinking straw
- Tree identification tags: Numbered (1–100) blue anodized aluminum tags and aluminum nails
- Field logbook: "Rite in the Rain" all-weather journal 390N
- Pens: "Rite in the Rain" all-weather pen #37, various indelible-ink ballpoint pens, permanent markers
- Photo identification board: 12"x20" dry erase board
- 2-way radio: Kenwood TK-380 800/900 mHz (FM band)

6.3.2 Location and Identification of Samples

The tree bark, forest floor litter and duff, mineral soil and tree core sampling was performed by four teams of three persons each. The four teams were designated by colors (red, blue, yellow, green) and split into two groups, each led by a sampling coordinator. Each sampling coordinator was responsible for identifying access routes, transporting two teams to access points, communicating with the teams for technical support and safety, and coordinating with the field data administrator. Each of the three sampling team members were assigned specific duties: sampler, note-taker, and navigator. The sampler was responsible for collecting all samples associated with the sample location. The note-taker was responsible for completing the FSDS form, labeling the samples and recording in the field logbook. The navigator was responsible for using the GPS unit and paper maps to find the sample location, recording the GPS sampling station waypoint, taking photographs, and assisting the other members of the team as needed.

Tree core samples were collected for age dating trees at 12 locations (designated "TC" on Table 6-1). Field duplicates were collected at 17 locations and are designated "FD" on Table 6-1. Tree bark samples are designated on Table 6-1 with "BK," forest floor litter samples are designated "DB," and mineral soil samples are designated "SO."

6.3.3 Collection of Tree Bark Samples

SOP TREE-LIBBY-OU3 in the Phase I SAP (EPA, 2007) specifies that trees from which bark samples were to be collected during Phase I sampling at OU3 were to be of 8-inch to 10-inch diameter, to ensure the trees to be sampled were alive during mine operation. This specification originated during discussions at the project kickoff meeting in Libby on August 21, 2007. During that meeting, foresters with the U.S. Forest Service and Plum Creek indicated that the bark of Douglas fir is the "roughest" of the tree species common to the area, and thus would have the greatest surface area for retention of LA fibers. In response to a question as to the typical diameter of a 30-year-old Douglas fir, the foresters estimated that a 30-year-old Douglas fir would range from 8 to 10 inches in diameter. At that time, it was decided Douglas fir bark would be collected during the Phase I RI; to ensure that sampled trees had been in existence during mine and mill operation, the minimum size of trees to be sampled would be 8 to 10 inches in diameter.

The bark/forest floor sampling teams were instructed to collect samples from trees within the 8-inch to 10-inch specification and as close as possible to the designated location on the transect alignment, but to use judgment in instances where such trees did not exist (their "rule of thumb" was to collect from trees within 100 yards of the designated location). In three instances (SL15-06, SL75-13 and SL195-07, Plate 6-1), no trees of minimum 8-inch diameter were near the transect sampling points and thus, smaller trees (6.7, 7.1 and 7.0 inches, respectively) were sampled. In other instances (e.g., in old-growth stands that had never been logged), only trees larger than 10 inches in diameter were available for sampling. While 47 of the trees sampled were greater than 10 inches in diameter, these larger, older trees were certainly alive during mining and milling operations and thus should be representative "reservoirs" of airborne LA fibers

(depending on bark shedding rates, it is likely that they contain a longer record than trees within the 8-inch to 10-inch range).

Once a suitable Douglas fir tree was selected, hairspray was applied as a fixative to the area of bark to be sampled to reduce the loss of LA fibers due to vibration or other disturbance during sampling. Bark samples were collected by using a rechargeable electric drill fitted with a dedicated hole saw, which produces a 2-inch diameter hole and a core of 1.85-inch diameter. The hole saw was attached to a 0.25-inch-diameter pilot bit, which assists in keeping the saw centered. Bark cores were cut by advancing the hole saw into the bark until the reddish bark sawdust was no longer apparent, which indicated the saw had penetrated the full thickness of the bark and into the cambium layer. The hole saw was withdrawn from the bark, the point of a dedicated paint can opening tool was inserted into the saw kerf, and the bark core was pried out and double-bagged in labeled "snack-size" Ziploc bags.

The age of selected trees was confirmed by collection and analysis of cores from about 10% of the sampled trees. In instances where a number of Douglas fir trees of appropriate type and size were present at a sampling location, preference was given to trees with rough bark over those with smoother bark, because rough bark is assumed to retain airborne LA fibers more effectively. All bark samples were collected from the side of the tree that faces the mine site (as determined by the compass feature of the GPS unit and verified with a magnetic compass), from a height of four to five feet above ground. If the bark being sampled crumbled or fractured during coring or extraction, the coring procedure was repeated at an adjacent spot on the tree until a coherent sample was obtained.

6.3.4 Collection of Forest Floor Litter Samples

To evaluate alternative pathways that LA fibers from the mine site might impact forested areas, forest floor litter (e.g., un-decomposed twigs, needles and other vegetation) and duff (partially- to fully-decomposed litter) layers were collected from around each tree from which a bark sample had been collected. Samples of the litter and duff were collected at a radius of five feet from the trunk of the tree sampled, at each of five

equally-spaced sub-sampling locations, to create a single composite sample for the station. The samples were collected by gloved hand, and no attempt was made to collect the litter and duff layers separately (i.e., the resulting bulk sample represents the full thickness of the predominantly organic forest floor materials that lie above the mineral soil layer). The sample was double-bagged in a labeled 1-gallon Ziploc bag.

6.3.5 Collection of Mineral Soil Samples

At each station, a composite mineral soil sample was collected with a dedicated stainless steel trowel from the same five locations from which the forest floor (litter/duff) samples had already been collected. The soil samples were collected from the upper two inches of mineral soil immediately beneath the duff layer. The five grab samples were collected with a dedicated steel trowel and double-bagged in a labeled quart-size Ziploc bag to create a composite mineral soil sample for the station. The mineral soil sample was not screened to remove organic material or rocks; however, the sampler manually removed as much non-soil material from the sample as possible.

6.3 FIELD-BASED QUALITY CONTROL SAMPLES

6.3.1 Field Duplicates

Table 6-1 summarizes field duplicates that were collected for each media. In general, field duplicates were prepared at a rate of approximately 10% (1 field duplicate per 10 field samples). Field duplicates are designated "FD" on Table 6-1.

6.4 SAMPLE HANDLING

6.4.1 Sample Containers

Ziploc brand plastic bags were used to collect and store tree bark, forest litter/duff and mineral soil samples. Forest floor litter and duff were collected in gallon-size, mineral soil samples were collected in quart-size, and bark samples were collected in "snack-size" bags. All samples were doubled-bagged.

6.4.2 Sample Preservation and Storage

Because the bark, forest floor litter and duff, and mineral soil samples collected during the Phase I RI at OU3 are to be analyzed only for LA fibers (which are not subject to biological degradation, decomposition or volatilization under standard conditions), preservation of these samples was not required. The samples were stored at room temperature at the MWH field office in Libby until they were shipped to the analytical laboratory or (for the mineral soil samples) hand-delivered to the EPA sample preparation laboratory in Troy, Montana.

6.5 SAMPLE DOCUMENTATION AND IDENTIFICATION

Sampling data were documented on OU3 Phase I RI-specific FSDS. Any special circumstances that influenced sample collection or resulted in deviations from sampling SOPs were documented in a field logbook. Scans of all FSDS in PDF files are located in Appendix D (on CD in pocket).

At the time of collection, each sample was assigned a unique 5-digit index identification (index ID) number. Sample IDs for all samples collected as part of the Phase I RI bear the prefix of "P1" (e.g., P1-12345). Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate) was documented on the FSDS, but was not included on the chain-of-custody, to ensure that the sample type was "blind" to the analytical laboratory.

Each field sampling team maintained a field logbook with sequentially numbered, non-removable pages. All potentially relevant information not recorded on the FSDS forms was recorded in the field logbook. Scans of the field logbooks are provided as PDF files in Appendix D (on CD in pocket).

6.6 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

Chain-of-custody (COC) was maintained until final disposition of the samples by the laboratories and acceptance of analytical results. A COC form specific to the OU3 Phase I RI sampling program accompanied every shipment of samples to the analytical laboratories. All corrections to the COC record were initialed and dated by the person who made the corrections. Each COC form includes signatures of the appropriate individuals indicated on the form. Original COCs accompanied the samples to the laboratory; copies were made and retained to document each change of custody. Scans of COCs are provided as PDF files in Appendix F (on CD in pocket).

All samples sent directly to an analytical laboratory were shipped by FedEx priority overnight service. Samples that required preparation at the EPA sample preparation laboratory in Troy, Montana were transported there by MWH sampling personnel.

6.7 TREE IDENTIFICATION TAG AND PHOTO

After the tree bark, forest floor litter/duff and mineral soil samples had been collected, each tree was tagged and identified so it can be located again.. A blue anodized aluminum tree tag was driven into the tree at a point near tree bark sample site and the number of the randomly selected tag was entered in the logbook. A length of surveyor's tape was tied around the trunk of the tree at a similar height as the tag. The photo identification board was labeled with the date and time, sample location, project and team identification and held adjacent to the tree to be photographed. Photographs in JPEG format are located in Appendix D (on CD in pocket).

6.8 COLLECTION OF TREE CORE

Tree core samples were collected at 12 locations by two teams (red and blue). One person on each of the two teams was trained and experienced with the tree increment borer. An increment borer consists of a handle, a bit, and a core extractor and was used to collect a tree ring core sample.. The sampler then inspected the tree core sample to verify that the center of the tree was reached. The tree core sample was placed in a plastic

drinking straw and sealed with clear packaging tape and placed into a labeled 1-gallon Ziploc bag.

6.9 SAFETY

The tree bark and forest floor sampling teams were equipped with two-way radios, first aid kits, whistles, bear spray and other safety and emergency equipment. Preliminary ambient air sampling had been conducted by MWH to establish a provisional OU3 Phase I RI downwind exclusion zone boundary as the arcuate mountaintop ridgeline north and east of the mine site. As a precaution, however, the team member designated to collect the samples wore a half-face resiprator while collecting bark/soil samples. The majority of the tree bark/forest floor sample locations were outside the provisional exclusion zone; with the exception of the team members who actually collected the samples, no other memebers of the team wore respirators. Level C PPE was worn by the team that collected tree bark and forest floor samples from within the preliminary OU3 boundary and upwind of the provisional exclusion zone (i.e., on the former mine property and to the south and west of the mountaintop ridgeline).

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 1 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL15	SL-15-2	BK	P1-00219	N	10/11/2007	X			
		SO	P1-00220	N	10/11/2007			X	
		DB	P1-00220	N	10/11/2007				X
	SL-15-3	BK	P1-00223	N	10/11/2007	X			
		SO	P1-00224	N	10/11/2007			X	
		DB	P1-00224	N	10/11/2007				X
	SL-15-4	BK	P1-00090	N	10/5/2007	X			
		SO	P1-00141	N	10/5/2007			X	
		DB	P1-00141	N	10/5/2007				X
	SL-15-5	BK	P1-00099	N	10/5/2007	X			
		SO	P1-00100	N	10/5/2007			X	
		DB	P1-00100	N	10/5/2007				X
	SL-15-6	BK	P1-00121	N	10/5/2007	X			
		BK	P1-00125	FD	10/5/2007	X			
		SO	P1-00122	N	10/5/2007			X	
		DB	P1-00122	N	10/5/2007				X
		SO	P1-00126	FD	10/5/2007			X	
		DB	P1-00126	FD	10/5/2007				X
	SL-15-7	BK	P1-00097	N	10/4/2007	X			
		SO	P1-00098	N	10/4/2007			X	
		DB	P1-00098	N	10/4/2007				X
	SL-15-8	BK	P1-00095	N	10/4/2007	X			
		SO	P1-00096	N	10/4/2007			X	
		DB	P1-00096	N	10/4/2007				X
	SL-15-9	BK	P1-00123	N	10/4/2007	X			
		SO	P1-00124	N	10/4/2007			X	
		DB	P1-00124	N	10/4/2007				X
	SL-15-10	BK	P1-00067	N	10/4/2007	X			
		TC	P1-00067	N	10/4/2007		X		
		SO	P1-00068	N	10/4/2007			X	
		DB	P1-00068	N	10/4/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 2 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL15 (continued)	SL-15-11	BK	P1-00063	N	10/3/2007	X			
		TC	P1-00063	N	10/3/2007		X		
		SO	P1-00064	N	10/3/2007			X	
		DB	P1-00064	N	10/3/2007				X
	SL-15-12	BK	P1-00045	N	10/3/2007	X			
		SO	P1-00046	N	10/3/2007			X	
		DB	P1-00046	N	10/3/2007				X
	SL-15-13	BK	P1-00057	N	10/2/2007	X			
		SO	P1-00056	N	10/2/2007			X	
		DB	P1-00056	N	10/2/2007				X
	SL-15-14	BK	P1-00043	N	10/2/2007	X			
		SO	P1-00044	N	10/2/2007			X	
		DB	P1-00044	N	10/2/2007				X
	SL-15-15	BK	P1-00061	N	10/2/2007	X			
		TC	P1-00061	N	10/2/2007		X		
		SO	P1-00062	N	10/2/2007			X	
		DB	P1-00062	N	10/2/2007				X
	SL-15-16	BK	P1-00041	N	10/2/2007	X			
		SO	P1-00042	N	10/2/2007			X	
		DB	P1-00041	N	10/2/2007				X
SL45	SL-45-1	BK	P1-00201	N	10/12/2007	X			
		SO	P1-00202	N	10/12/2007			X	
		DB	P1-00202	N	10/12/2007				X
	SL-45-2	BK	P1-00221	N	10/11/2007	X			
		SO	P1-00222	N	10/11/2007			X	
		DB	P1-00222	N	10/11/2007				X
	SL-45-3	BK	P1-00225	N	10/11/2007	X			
		SO	P1-00226	N	10/11/2007			X	
		DB	P1-00226	N	10/11/2007				X
	SL-45-4	BK	P1-00142	N	10/5/2007	X			
		SO	P1-00143	N	10/5/2007			X	
		DB	P1-00143	N	10/5/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 3 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL45 (continued)	SL-45-5	BK	P1-00071	N	10/5/2007	X			
		BK	P1-00072	FD	10/4/2007	X			
		SO	P1-00073	N	10/4/2007			X	
		DB	P1-00073	N	10/4/2007				X
		SO	P1-00074	FD	10/4/2007			X	
		DB	P1-00075	FD	10/5/2007				X
	SL-45-6	BK	P1-00084	N	10/4/2007	X			
		SO	P1-00085	N	10/4/2007			X	
		DB	P1-00085	N	10/4/2007				X
	SL-45-7	BK	P1-00039	N	10/3/2007	X			
		SO	P1-00040	N	10/3/2007			X	
		DB	P1-00040	N	10/3/2007				X
	SL-45-8	BK	P1-00082	N	10/3/2007	X			
		TC	P1-00193	N	10/8/2007		X		
		SO	P1-00083	N	10/3/2007			X	
		DB	P1-00083	N	10/3/2007				X
	SL-45-9	BK	P1-00060	N	10/3/2007	X			
		SO	P1-00081	N	10/3/2007			X	
		DB	P1-00081	N	10/3/2007				X
	SL-45-10	BK	P1-00037	N	10/3/2007	X			
		SO	P1-00038	N	10/3/2007			X	
		DB	P1-00038	N	10/3/2007				X
	SL-45-11	BK	P1-00035	N	10/3/2007	X			
		SO	P1-00036	N	10/3/2007			X	
		DB	P1-00036	N	10/3/2007				X
	SL-45-12	BK	P1-00058	N	10/3/2007	X			
		SO	P1-00059	N	10/3/2007			X	
		DB	P1-00059	N	10/3/2007				X
	SL-45-13	BK	P1-00031	N	10/2/2007	X			
		SO	P1-00032	N	10/2/2007			X	
		DB	P1-00032	N	10/2/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 4 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL45 (continued)	SL-45-14	BK	P1-00033	N	10/2/2007	X			
		SO	P1-00034	N	10/2/2007			X	
		DB	P1-00034	N	10/2/2007				X
	SL-45-15	BK	P1-00053	N	10/2/2007	X			
		SO	P1-00054	N	10/2/2007			X	
		DB	P1-00054	N	10/2/2007				X
	SL-45-16	BK	P1-00051	N	10/2/2007	X			
		TC	P1-00051	N	10/2/2007		X		
		SO	P1-00052	N	10/2/2007			X	
		DB	P1-00052	N	10/2/2007				X
SL75	SL-75-2	BK	P1-00227	N	10/12/2007	X			
		SO	P1-00228	N	10/12/2007			X	
		DB	P1-00228	N	10/12/2007				X
	SL-75-3	BK	P1-00229	N	10/12/2007	X			
		SO	P1-00230	N	10/12/2007			X	
		DB	P1-00230	N	10/12/2007				X
	SL-75-4	BK	P1-00163	N	10/6/2007	X			
		TC	P1-00163	N	10/6/2007		X		
		SO	P1-00164	N	10/6/2007			X	
		DB	P1-00164	N	10/6/2007				X
	SL-75-5	BK	P1-00107	N	10/6/2007	X			
		SO	P1-00108	N	10/6/2007			X	
		DB	P1-00108	N	10/6/2007				X
	SL-75-6	BK	P1-00109	N	10/6/2007	X			
		SO	P1-00110	N	10/6/2007			X	
		DB	P1-00110	N	10/6/2007				X
	SL-75-7	BK	P1-00167	N	10/6/2007	X			
		SO	P1-00168	N	10/6/2007			X	
		DB	P1-00168	N	10/6/2007				X
	SL-75-8	BK	P1-00169	N	10/6/2007	X			
		SO	P1-00170	N	10/6/2007			X	
		DB	P1-00170	N	10/6/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 5 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL75 (continued)	SL-75-9	BK	P1-00127	N	10/5/2007	X			
		SO	P1-00128	N	10/5/2007			X	
		DB	P1-00128	N	10/5/2007				X
	SL-75-13	BK	P1-00091	N	10/3/2007	X			
		BK	P1-00092	FD	10/3/2007	X			
		SO	P1-00093	N	10/3/2007			X	
		DB	P1-00093	N	10/3/2007				X
		SO	P1-00094	FD	10/3/2007			X	
		DB	P1-00094	FD	10/3/2007				X
	SL-75-14	BK	P1-00065	N	10/3/2007	X			
		SO	P1-00066	N	10/3/2007			X	
		DB	P1-00066	N	10/3/2007				X
	SL-75-15	BK	P1-00101	N	10/5/2007	X			
		BK	P1-00102	FD	10/5/2007	X			
		SO	P1-00103	N	10/5/2007			X	
		DB	P1-00103	N	10/5/2007				X
		SO	P1-00104	FD	10/5/2007			X	
		DB	P1-00104	FD	10/5/2007				X
	SL-75-16	BK	P1-00129	N	10/5/2007	X			
		TC	P1-00129	N	10/5/2007		X		
		SO	P1-00130	N	10/5/2007			X	
		DB	P1-00130	N	10/5/2007				X
SL135	SL-135-1	BK	P1-00139	N	10/12/2007	X			
		SO	P1-00140	N	10/12/2007			X	
		DB	P1-00140	N	10/12/2007				X
	SL-135-2	BK	P1-00137	N	10/12/2007	X			
		SO	P1-00138	N	10/12/2007			X	
		DB	P1-00138	N	10/12/2007				X
	SL-135-3	BK	P1-00165	N	10/6/2007	X			
		SO	P1-00166	N	10/6/2007			X	
		DB	P1-00166	N	10/6/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL135 (continued)	SL-135-4	BK	P1-00075	N	10/4/2007	X			
		BK	P1-00076	FD	10/4/2007	X			
		SO	P1-00077	N	10/4/2007			X	
		DB	P1-00077	N	10/4/2007				X
		SO	P1-00078	FD	10/4/2007			X	
		DB	P1-00078	FD	10/4/2007				X
	SL-135-5	BK	P1-00086	N	10/4/2007	X			
		TC	P1-00086	N	10/4/2007		X		
		SO	P1-00087	N	10/4/2007			X	
		DB	P1-00087	N	10/4/2007				X
	SL-135-6	BK	P1-00088	N	10/4/2007	X			
		SO	P1-00089	N	10/4/2007			X	
		DB	P1-00089	N	10/4/2007				X
	SL-135-7	BK	P1-00079	N	10/4/2007	X			
		SO	P1-00080	N	10/4/2007			X	
		DB	P1-00080	N	10/4/2007				X
	SL-135-8	BK	P1-00159	N	10/6/2007	X			
		SO	P1-00160	N	10/6/2007			X	
		DB	P1-00160	N	10/6/2007				X
SL195	SL-195-2	BK	P1-00203	N	10/12/2007	X			
		SO	P1-00204	N	10/12/2007			X	
		DB	P1-00204	N	10/12/2007				X
	SL-195-3	BK	P1-00135	N	10/8/2007	X			
		SO	P1-00136	N	10/8/2007			X	
		DB	P1-00136	N	10/8/2007				X
	SL-195-4	BK	P1-00133	N	10/8/2007	X			
		SO	P1-00134	N	10/8/2007			X	
		DB	P1-00134	N	10/8/2007				X
	SL-195-5	BK	P1-00191	N	10/8/2007	X			
		TC	P1-00191	N	10/8/2007		X		
		SO	P1-00192	N	10/8/2007			X	
		DB	P1-00192	N	10/8/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 7 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL195 (continued)	SL-195-6	BK	P1-00113	N	10/8/2007	X			
		BK	P1-00114	FD	10/8/2007	X			
		SO	P1-00115	N	10/8/2007			X	
		DB	P1-00115	N	10/8/2007				X
		SO	P1-00116	FD	10/8/2007			X	
		DB	P1-00116	FD	10/8/2007				X
	SL-195-7	BK	P1-00105	N	10/5/2007	X			
		SO	P1-00106	N	10/5/2007			X	
		DB	P1-00106	N	10/5/2007				X
	SL-195-8	BK	P1-00161	N	10/5/2007	X			
		TC	P1-00161	N	10/5/2007		X		
		SO	P1-00162	N	10/5/2007			X	
		DB	P1-00162	N	10/5/2007				X
	SL-195-10	BK	P1-00171	N	10/7/2007	X			
		SO	P1-00172	N	10/7/2007			X	
		DB	P1-00172	N	10/7/2007				X
	SL-195-11	BK	P1-00111	N	10/7/2007	X			
		SO	P1-00112	N	10/7/2007			X	
	SL-195-12	DB	P1-00112	N	10/7/2007				X
		BK	P1-00148	N	10/7/2007	X			
		SO	P1-00149	N	10/7/2007			X	
		DB	P1-00149	N	10/7/2007				X
SL255	SL-255-2	BK	P1-00213	N	10/11/2007	X			
		SO	P1-00214	N	10/11/2007			X	
		DB	P1-00214	N	10/11/2007				X
	SL-255-3	BK	P1-00211	N	10/9/2007	X			
		SO	P1-00212	N	10/9/2007			X	
		DB	P1-00212	N	10/9/2007				X
	SL-255-4	BK	P1-00179	N	10/9/2007	X			
		SO	P1-00180	N	10/9/2007			X	
		DB	P1-00180	N	10/9/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 8 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL255 (continued)	SL-255-5	BK	P1-00175	N	10/9/2007	X			
		TC	P1-00175	N	10/9/2007		X		
		BK	P1-00176	FD	10/9/2007	X			
		SO	P1-00177	N	10/9/2007			X	
		DB	P1-00177	N	10/9/2007				X
		SO	P1-00178	FD	10/9/2007			X	
		DB	P1-00178	FD	10/9/2007				X
	SL-255-6	BK	P1-00173	N	10/9/2007	X			
		SO	P1-00174	N	10/9/2007			X	
		DB	P1-00174	N	10/9/2007				X
SL315	SL-315-1	BK	P1-00215	N	10/11/2007	X			
		SO	P1-00216	N	10/11/2007			X	
		DB	P1-00216	N	10/11/2007				X
	SL-315-2	BK	P1-00217	N	10/11/2007	X			
		SO	P1-00218	N	10/11/2007			X	
		DB	P1-00218	N	10/11/2007				X
	SL-315-3	BK	P1-00131	N	10/7/2007	X			
		SO	P1-00132	N	10/7/2007			X	
		DB	P1-00132	N	10/7/2007				X
	SL-315-4	BK	P1-00151	N	10/5/2007	X			
		SO	P1-00152	N	10/5/2007			X	
		DB	P1-00152	N	10/5/2007				X
	SL-315-5	BK	P1-00153	N	10/6/2007	X			
		BK	P1-00154	FD	10/6/2007	X			
		SO	P1-00155	N	10/6/2007			X	
		DB	P1-00155	N	10/6/2007				X
		SO	P1-00156	FD	10/6/2007			X	
		DB	P1-00156	FD	10/6/2007				X
	SL-315-6	BK	P1-00144	N	10/6/2007	X			
		TC	P1-00144	N	10/6/2007		X		
		SO	P1-00145	N	10/6/2007			X	
		DB	P1-00145	N	10/6/2007				X

TABLE 6-1

FOREST SOIL/TREE BARK
SUMMARY OF ANALYSES BY SAMPLING LOCATIONS
(Page 9 of 9)

Transect	Station ID	Matrix	Index_ID	Sample Type	Sample Date	TEM-ISO10312 (a)	Age Core	PLM	Archive
SL315 (continued)	SL-315-7	BK	P1-00146	N	10/6/2007	X			
		SO	P1-00147	N	10/6/2007			X	
		DB	P1-00147	N	10/6/2007				X
	SL-315-8	BK	P1-00157	N	10/6/2007	X			
		SO	P1-00158	N	10/6/2007			X	
		DB	P1-00158	N	10/6/2007				X

BK Tree Bark
TC Tree Core
SO Forest Soil
DB Soil Duff
N Field Sample
FD Field Duplicate
(a) Libby Specific Modifications

7.0 AMBIENT AIR SAMPLING

7.1 SUMMARY OF THE AMBIENT AIR SAMPLING PROGRAM

The basic sampling design for ambient air sampling performed during the Phase I RI consisted of two roughly concentric, partial rings of stationary air monitoring stations placed around the mine. The inner ring is close to the boundary of the disturbed area of the mine site, and the outer ring is close to the perimeter of the former mine property boundary. Plate 7-1 shows the locations of the ambient air monitoring stations. Each sample was collected over a period of five days, with a sample round being performed once per week for four weeks.

7.2 ANALYSES

All ambient air samples were submitted for LA analysis by TEM, using ISO10312(a) counting protocols, as modified by Libby-specific laboratory modifications (discussed in the SAP).

7.3 SAMPLING EQUIPMENT

Ambient air samples were collected and equipment was calibrated in accordance with SOP AMBLIBBY-OU3 of the SAP (EPA, 2007). Because the objective of the sampling effort was to estimate long-term average concentration values, all ambient air samples were collected using low-flow (2 liters per minute; LPM) stationary air monitors over an extended period of time (e.g., five days).

Samples were collected using 25-mm diameter, 0.8-μm pore size MCE filter cassettes. This filter type allows for the collection of samples without excessive backpressure. All samples were collected at a height approximately six feet above ground level.

- Sampling pump: SKC AirChek 2000 programmable sample pump
- Power supply: Energizer deep cycle 29HM battery

- Pump housing: Stanley weatherproof storage container, lined with 2-inch-thick styrofoam
- Stand: T-bar steel fencepost with PVC hook extension. The PVC extension positioned the cassette downward, six inches away from the fencepost and at a height of six feet
- Inert tubing: 10-foot section of Tygon brand R-3603 tubing, 1/4" inner diameter and 7/16" outer diameter
- Rotameter: Dwyer VFB-65 rotameter with calibrated graduations within 5% accuracy of expected flow rate
- Field logbook: "Rite in the Rain" all-weather journal 390N
- Plastic bags: Ziploc 1-quart freezer bags
- Clear packaging tape: Scotch brand packaging tape
- Pen: "Rite in the Rain" all weather pen #37
- Electronic calibrator: BIOS Drycal Defender 520, S/N 111363, Cert #101416, Calibration date 05/08/07 (due 05/08/08)

7.4 LOCATION AND IDENTIFICATION OF AMBIENT AIR SAMPLES

The ambient air sampling at OU3 was performed by Meteorological Solutions Inc. The sampling protocol was performed by a two-person team at the eight locations depicted on Plate 7-1. All sampling stations were identically constructed, equipped, and maintained. Four consecutive sampling periods were collected, each sampling period being five days (120 hours) with a flow rate of 2 LPM; the design air volume to be sampled during each five-day sampling period was 14,400 liters. Due to pump faults and flow-rate variance, the actual volumes sampled during each period ranged from 9,987 liters to 14,402 liters (see Table 7-2).

7.5 CALIBRATION OF EQUIPMENT

7.5.1 Calibration of Rotameter with an Electronic Calibrator

The BIOS calibrator automatically adjusts for temperature and pressure, eliminating any further calculations. The calibration train for the rotameter was set up using the train described in EPA SOP #2015 Figure 4 (EPA, 2007). The rotameter was held vertically, allowing the sampling pump to send a flow through the rotameter and BIOS meter. The rotameter was set at various flow rates to obtain a range of readings for flow rate calibration.

7.5.2 Calibration of Sampling Pump

All pumps were calibrated at the beginning of each sampling period using the calibration train as described in EPA SOP #2015 Figure 5 (EPA, 2007) to the desired flow of 2.0 LPM. The calibration procedure included connecting the rotameter to the cassette using an 8-inch-long section of Tygon tubing and the cassette cap. The flow was recorded and the pump was adjusted to achieve a 1.9 LPM rotameter reading (using the center of the ball), which verified a true 2.0 LPM flow as determined by the electronic calibrator. The dedicated calibration equipment (cassette cap and Tygon tubing) were stored in a plastic bag on site.

7.6 SAMPLING PROTOCOL

The sample cassette was attached to the PVC pole extension facing down within the 45-degree limit at the desired height of six feet above the ground. At the end of each sampling period the cassette was rotated to face upward, the pump was stopped and the cap was placed on the cassette. Sample cassettes were placed in Ziploc freezer bags and labeled. Field blanks were collected daily at random sites.

7.6.1 Pump Failure Procedures

This SOP of September 26, 2007 was changed during the kick-off meeting due to a change requiring continuous sampling regardless of pump fault. The procedure required that, upon arrival at a site that had a pump failure, the time of observed fault was noted. The "as found" flow rate was indicated as 0 LPM. The internal history of the pump was downloaded and the pump was restarted and adjusted to 2.0 LPM flow. When a pump faulted a second time, the above procedure was repeated and sampling continued.

7.7 QUALITY CONTROL SAMPLES

7.7.1 Lot Blanks

Before any air cassettes were used for asbestos sampling, the lot was verified to be asbestos-free. This was accomplished by sending five blanks per lot of cassettes for TEM analysis using ISO 10312 counting protocols, as modified by Libby-specific laboratory modifications (discussed in the SAP).

7.7.2 Field Blanks

A field blank for ambient air was prepared by removing the sampling cassette from the box, opening the cassette to the air in the area where the investigative samples were to be taken, then closing the cassette and packaging for shipment and analysis. Field blanks for ambient air were collected at a rate of one each day that ambient air sampling occurred. Field blanks are designated "FB" on Table 7-1.

7.7.3 Field Duplicates

Ambient air field duplicate samples (designated "FD") are summarized on Table 7-1. Field duplicates were prepared at a rate of 20% (1 field duplicate per sampling period).

7.8 SAMPLE HANDLING

At the time of collection, each sample was labeled with a unique 5-digit sequential index identification (index ID) number. The index ID for all samples collected as part of Phase I sampling have a prefix of "P1" (e.g., P1-12345). Information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank) was documented on the FSDS, but this information was not included on the chain-of-custody, to ensure that the sample type was submitted "blind" to the analytical laboratory.

Each field sampling team maintained a field logbook with sequentially-numbered, non-removable pages. All potentially relevant information on sampling activities and conditions that were not otherwise recorded on the FSDS forms were recorded in the field logbooks. Scans of the ambient air sampling field logbooks are contained in Appendix E (on CD in pocket).

7.9 SAMPLE CHAIN-OF-CUSTODY AND SHIPMENT

A COC form specific to OU3 Phase I RI sampling accompanied every shipment of samples to the analytical laboratory. The purposes of the COC form are to establish the documentation necessary to trace sample possession from the time of collection to final disposal, and to identify the type of analysis requested. All corrections to the COC record were initialed and dated by the person who made the corrections. Each COC form included signatures of the appropriate individuals indicated on the form. The original COCs accompany the samples to the laboratory and copies documenting each custody change were retained and will be kept on file. One copy of the COC was kept by field personnel. Scans of COCs are provided in PDF format in Appendix F (on CD in pocket).

TABLE 7-1

AMBIENT AIR
SAMPLING SUMMARY
(Page 1 of 2)

Station ID	Index ID	Sample Type	Start Date	Start Time	End Date	End Time	Total Sample Volume (L)	Analytical Method TEM-ISO10312 (a)
A-1	P1-00005	N	10/2/2007	1032	10/7/2007	1030	14382	X
	P1-00017	N	10/7/2007	1030	10/12/2007	927	14274	X
	P1-00028	FB	10/11/2007	1045	NA	NA	0	X
	P1-00243	N	10/12/2007	928	10/17/2007	822	14254	X
	P1-00262	AB	10/15/2007	810	NA	NA	0	X
	P1-00277	N	10/17/2007	825	10/22/2007	814	14378	X
	P1-00030	AB	10/19/2007	802	NA	NA	0	X
A-2	P1-00006	N	10/2/2007	1100	10/7/2007	1055	14376	X
	P1-00018	N	10/7/2007	1057	10/12/2007	948	14262	X
	P1-00019	FD	10/7/2007	1059	10/12/2007	951	14264	X
	P1-00026	AB	10/9/2007	955	NA	NA	0	X
	P1-00244	N	10/12/2007	948	10/17/2007	830	14244	X
	P1-00278	N	10/17/2007	841	10/22/2007	828	14375	X
A-3	P1-00010	N	10/2/2007	1242	10/7/2007	1220	14335	X
	P1-00012	AB	10/4/2007	1047	NA	NA	0	X
	P1-00024	N	10/7/2007	1223	10/12/2007	1115	14264	X
	P1-00027	AB	10/10/2007	1037	NA	NA	0	X
	P1-00250	N	10/12/2007	1115	10/17/2007	950	14215	X
	P1-00261	AB	10/14/2007	830	NA	NA	0	X
	P1-00284	N	10/17/2007	951	10/22/2007	918	14334	X
	P1-00029	AB	10/18/2007	836	NA	NA	0	X
A-4	P1-00007	N	10/2/2007	1128	10/7/2007	1122	12974	X
	P1-00020	N	10/7/2007	1124	10/12/2007	1017	14253	X
	P1-00021	FB	10/7/2007	1130	NA	NA	0	X
	P1-00245	N	10/12/2007	1020	10/17/2007	855	14077	X
	P1-00246	FD	10/12/2007	1013	10/17/2007	901	14228	X
	P1-00279	N	10/17/2007	857	10/22/2007	839	14208	X
	P1-00280	FB	10/17/2007	902	NA	NA	0	X
A-5	P1-00008	N	10/2/2007	1157	10/7/2007	1144	12984	X
	P1-00022	N	10/7/2007	1145	10/12/2007	1032	14239	X
	P1-00247	N	10/12/2007	1033	10/17/2007	921	14256	X
	P1-00248	FB	10/12/2007	1034	NA	NA	0	X
	P1-00281	N	10/17/2007	924	10/22/2007	852	14336	X
	P1-00282	FD	10/17/2007	927	10/22/2007	854	14320	X
	P1-00415	AB	10/21/2007	808	NA	NA	0	X
A-6	P1-00009	N	10/2/2007	1221	10/7/2007	1205	14368	X
	P1-00011	AB	10/3/2007	1139	NA	NA	0	X

TABLE 7-1

AMBIENT AIR
SAMPLING SUMMARY
(Page 2 of 2)

Station ID	Index ID	Sample Type	Start Date	Start Time	End Date	End Time	Total Sample Volume (L)	Analytical Method TEM-ISO10312 (a)
	P1-00013	AB	10/5/2007	1024	NA	NA	0	X
	P1-00023	N	10/7/2007	1206	10/12/2007	1047	14214	X
	P1-00249	N	10/12/2007	1048	10/17/2007	938	14260	X
	P1-00260	FB	10/13/2007	805	NA	NA	0	X
	P1-00283	N	10/17/2007	940	10/22/2007	907	14356	X
	P1-00264	FB	10/20/2007	826	NA	NA	0	X
A-7	P1-00001	N	10/2/2007	922	10/7/2007	923	14402	X
	P1-00002	FD	10/2/2007	925	10/7/2007	925	14379	X
	P1-00014	FB	10/6/2007	841	NA	NA	0	X
	P1-00015	N	10/7/2007	941	10/12/2007	847	14263	X
	P1-00241	N	10/12/2007	843	10/17/2007	751	14296	X
	P1-00263	AB	10/16/2007	753	NA	NA	0	X
	P1-00275	N	10/17/2007	754	10/22/2007	739	14370	X
A-8	P1-00003	N	10/2/2007	1000	10/7/2007	1000	12934	X
	P1-00004	FB	10/2/2007	1000	NA	NA	0	X
	P1-00016	N	10/7/2007	1005	10/12/2007	905	9987	X
	P1-00025	AB	10/8/2007	810	NA	NA	0	X
	P1-00242	N	10/12/2007	900	10/17/2007	805	14290	X
	P1-00276	N	10/17/2007	806	10/22/2007	757	14382	X

(a) With Libby specific modifications
N Field Sample
FD Field Duplicate
FB Field Blank
AB Ambient Blank
NA Not applicable

ATTACHMENT A

FIELD MODIFICATION APPROVAL FORMS

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-01
Libby OU3 Phase I Sampling & Analysis Plan

Requested by: Lynn Woodbury Date: October 5, 2007

Description of Deviation:
All mine waste sampling locations will be identified with the prefix MS- rather than MW- to avoid potential confusion by current and future data users in the type of station sampled (i.e., "MW" is typically a designation reserved for "monitoring well"). All sampling labels and field sample data sheet (FSDS) forms will be prepared with the MS-prefix. This modification will impact the station identifiers in Figure 5-1, Table 5-2, and Attachment E.

☑ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

Bonita Lavelle, EPA RPM

10/12/07
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-02
Libby OU3 Phase I Sampling & Analysis Plan

Requested by: Lynn Woodbury Date: October 5, 2007

Description of Deviation:
Page 4 of OU3 SOP No. 8 (Sample Handling and Shipping) states "*For preserved samples (except VOCs), the pH of the sample will be checked following collection of the sample. If the pH is not at the required level, additional preservative (provided by the laboratory) will be added to the sample container.*" For non-asbestos analyses, with the exception of the filtered samples for dissolved metals and dissolved organic carbon (DOC) analysis, sample containers will be provided by the analytical laboratory pre-preserved. Therefore, checking of the sample pH is not necessary at the time of field collection because no corrective action can be performed. At the time of receipt by the analytical laboratory, the pH will be checked and additional preservative will be added as needed to achieve the target pH level.

☑ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

Bonita Lavelle, EPA RPM

10/12/07
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-03
Libby OU3 Phase I Sampling & Analysis Plan

Requested by: Stephanie Boehnke /MWH Date: 10/17/2007

Description of Deviation:
TOC analytical method change for sediment (modification to Phase I OU3 SAP Table 6-3).....
Table 6-3 (Analysis of Sediment Samples for Non-Asbestos Parameters) lists methods EPA 415.1 and SW846-9060 for TOC. These methods are for water samples and are not appropriate for soils analysis. Energy Laboratory can perform either the Walkley-Black or the LECO method for TOC analysis in soils. Kathy Tegtmeyer of NewFields requested the LECO (combustion) method. The laboratory will be performing the LECO method for TOC in soils.

☑ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

Bonita Lavelle, EPA RPM

11/7/07
Date

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-04
Libby OU3 Phase I Sampling & Analysis Plan

Requested by: Energy Laboratories, Inc. (William T Brown)___ Date:_10/19/07_____

Description of Deviation:
-- Sample prep/analysis changes for solid media samples (TOC, fluoride and paste pH). Energy Laboratories is not set up to dry and grind samples that may contain asbestos. Due to health and safety concerns, the sample prep was modified to prep the samples on an as received basis for the TOC, Fluoride and paste pH test methods.

☒ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

_____
_____
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☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

_____
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_____

Bonita Lavelle, EPA RPM — Date: 11/7/07

FIELD MODIFICATION APPROVAL FORM
LFM-OU3-05
Libby OU3 Phase I Sampling & Analysis Plan

Requested by: Kathy Tegtmeyer, NewFields Date: 11/2/07

Description of Deviation:

This field modification applies to the descriptions of extractable petroleum hydrocarbon (EPH) analyses provided in Sections 6.2.1 (page 41) and 6.2.2 (page 42) of the Final Phase 1 Sampling and Analysis Plan (SAP). The SAP specifies that soil and sediment samples with greater than 50 mg/Kg EPH and water samples with greater than 300 µg/L EPH be analyzed for a listed group of compounds. The lists of compounds on pages 41 and 42 are to be replaced with the following:

C9-C18 Aliphatics
C19-C36 Aliphatics
C11-C22 Aromatics
Acenaphthene
Anthracene
Benz(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Pyrene

The compounds listed above are the petroleum hydrocarbon compounds with State of Montana risk-based screening levels under their Tier 1 risk-based corrective action evaluation process for petroleum hydrocarbon releases (Montana Department of Environmental Quality, 2003. *Montana Tier 1 Risk Based Corrective Action Guidance for Petroleum Releases*).

Chromatograms generated for analyses of C9-C36 aliphatics and C11-C22 aromatics will be recorded and reported by Energy Laboratories. Chromatograms will be maintained in the project record for possible future reference.

☑ EPA Region 8 has reviewed this field modification approves as proposed.

☐ EPA Region 8 has reviewed this field modification and approves with the following exceptions:

_____
_____
_____
_____

☐ EPA Region 8 has reviewed this field modification and does not agree with the proposed approach for the following reasons:

_____
_____
_____

Bonita Lavelle, EPA RPM

11/6/07
Date

ATTACHMENT B

SAMPLING AUDIT FORMS

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 1

Weather: P. Cloudy Temperature (°F): 42°F

Pressure (in. Hg) _____ Sample Index ID No. 01-00005

Sample Time: 0850-0910 0932 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Petersen, Tyler Ward, (Jeff - Chapman Construction)

Rotometer ID No.: RM02

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. 24946

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: Logbook was Completed

Comments: _____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 7

Weather: P. Cloudy Temperature (F): 42°F

Pressure (in. Hg) _____ Sample Index ID No. PI-00001 2nd

Sample Time: 0835-0845 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, Jeff-Chapman Corps

Rotometer ID No.: RM-02

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. 24996-Dup/24687 - Normal

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☐No

Flow Rate Adjusted? ☐Yes ☒No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒25mm, 0.8µm pore size ☐Other_____

Field Duplicate: ☒Yes ☐No Dup Index ID No. PI-00002

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐Other

_____

FSDS Completed: ☒Yes ☒Other: Logbook finish in the field

Comments:_____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 8

Weather: P.Cloudy Temperature (°F): 42°F

Pressure (in. Hg) _____ Sample Index ID No. PJ-00003

Sample Time: 0935 - 0936 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, (Jeff-Chapman - Construction)

Rotometer ID No.: RM-07

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. 2499A

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: Logbook in the field

Comments: _____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 2

Weather: P. Cloudy Temperature (°F): 45°F

0940 Pressure (in. Hg) _____ Sample Index ID No: PI-00006 2/6/1709

0950 Sample Time: Just Flow Check Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, (Jeff - Chapman Construction)

Rotometer ID No.: RM02

Rotometer Previous Calibration? Yesterday

Sample Pump ID No. 24709

Sample Pump Previous Calibration? 10/3/07 10:18 AM

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☒ Other: Logbook in the field as well

Comments: Everything is good. Pump running rotometer checked.

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 1

Weather: P. Cloudy Temperature (°F): 40°F

Pressure (in. Hg) _____ Sample Index ID No. PI-00087, 278|250

Sample Time: 1005 Flow Check 1015 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, Jeff - Chapman Construction.

Rotometer ID No.: RM-02

Rotometer Previous Calibration? Yesterday

Sample Pump ID No. ~~DAP~~ 26046

Sample Pump Previous Calibration? Yesterday

Current Flow Rate: 1.87 Actual Flow 1.97

Sample Calibration: ☒ Yes ☐No

Flow Rate Adjusted? ☒Yes ☐No Raised .03 L/min

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☑ 25mm, 0.8µm pore size ☐Other _____

Field Duplicate: ☐Yes ☒No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐Other

_____

FSDS Completed: ☒Yes ☐Other: Logbook Notes no FSDS in the field back at ATV. Just Flow check.

Comments: _____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 5

Weather: P. Mostly Temperature (°F): 43°F

Pressure (in. Hg) Sample Index ID No. PI-00008

Sample Time: 1018 - 1024 Flow Chart Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Petersen, Tyler Ward, Jeff - Chapman Construction.

Rotometer ID No.: RM-07

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. 2448

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other

Field Duplicate: ☐ Yes ☒ No Dup Index ID No.

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☒ Other: Logbook was completed in field

Comments: Mike b's on the road

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 6

Weather: P. Cloudy, Fog Temperature (°F): 43°F

Pressure (in. Hg) _____ Sample Index ID No. PI-00009, C782730

Sample Time: 1030 - 1038 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, Jeff Chapman Construction

Rotometer ID No.: RM-02

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. 24757

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 1.9 ~ 2.0

Sample Calibration: ☒ Yes ☒ No (CHD, 10/4/07)

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☒ Other: Logbook recording in the field

Comments: _____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/4/07 Station No.:A- 3

Weather: P. Cloudy Temperature (°F): ~20°F

Pressure (in. Hg) _____ Sample Index ID No. PF00010 29 8130

Sample Time: 1044 - 1053 Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, Tyler Ward, Jeff-Chapman Construction

Rotometer ID No.: RM02

Rotometer Previous Calibration? Yesterday 10/3/07

Sample Pump ID No. (CHO 10/4/07 RM02) 24710

Sample Pump Previous Calibration? Yesterday 10/3/07

Current Flow Rate: 2.0

Sample Calibration: ☒ Yes ☒ No NA

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☒ Other: Logbook was completed in the field

Comments: The pump was switch back from the end test mode to the normal collection mode, pump still collected volume data

1051 (Field BLANK PF-00012) Taken by the filter location.

Arrival: 0828
Depart: 0831

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 7

Weather: Cloudy 45°F Temperature (°F): 45°F

Pressure (in. Hg) _____ Sample Index ID No. A-0005

Sample Time: 0828-0831 Time at loc. Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, ~~Tyler Ward~~, CTO 10/10/07

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. 24687

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: ~~1.80~~ 1.88

Sample Calibration: ☒ Yes ☐No

Flow Rate Adjusted? ☒Yes ☐No ↑.12

Final Flow Rate: 2.0 L/min

Sample Flow Rate: 2.0 L/min (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐Other _____

Field Duplicate: ☐Yes ☒No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐Other

_____

FSDS Completed: ☒Yes ☒Other: logbook worked on in the field

Comments: _____

Arrival: 0840
Depart: 0925

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 8

Weather: Cloudy Temperature (°F): 40°F

Pressure (in. Hg) _____ Sample Index ID No. PI-00016

Sample Time: 0840-0925 Time at loc. Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson, [illegible]

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. Old 24711 / New: 24994

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: 0.0 L/min (Pump Off) SOP Reference = 0.0 flow for the day.

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☒ Yes ☐ No

Final Flow Rate: 2.0 L/min

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. —

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☒ Other: Logbook completed as well.

Comments: Pump Failure - Reset Pump.

Arrival: 0938
Depart: 0952

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 1
Weather: P. Cloudy Temperature (°F): 44°F
Pressure (in. Hg) _____ Sample Index ID No. PI-000197
Sample Time: 0938 - 0952 Time at Loc. Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin
MSI Personnel: Scott Adamson, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. 24976

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: 2.0 L/min

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0 L/min

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: logbook completed.

Comments: _____

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 2

Weather: Foggy Temperature (°F): 41°F

Pressure (in. Hg) Sample Index ID No. PF00018

Sample Time: 0952-1000 Time at Loc. Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin

MSI Personnel: Scott Adamson, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/8/07

Sample Pump ID No. 24109

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: 2.0 L/min / 2.0 L/min Dup

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0 L/min / 2.0 L/min Dup

Sample Flow Rate: 2.0 / 2.0 Dup. (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other

Field Duplicate: ☒ Yes ☐ No Dup Index ID No. PF00019 ID: 24996

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☒ Other: Logbook Completed in field.

Comments:

Arrival: 1011
Depart: 1020

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 4
Weather: Foggy Temperature (°F): 40°F
Pressure (in. Hg) 30.1 Sample Index ID No. PF-00020
Sample Time: 1011-1020 Time at Location Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin
MSI Personnel: Scott Adamson, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. ~~2616~~ 26046

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: 2.0 L/min

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0 L/min

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other

Field Duplicate: ☐ Yes ☒ No Dup Index ID No.

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☒ Other: Logbook completed

Comments:

Arrival 1025
Depart: 1030

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 5
Weather: PCloudy Temperature (°F): 45°F
Pressure (in. Hg) _____ Sample Index ID No. PI-00022
Sample Time: 1025-1030 Time at Location Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin
MSI Personnel: Scott Hanssen, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. 24748

Sample Pump Previous Calibration? 10/8/08

Current Flow Rate: 2.0 L/min

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0 L/MIN

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: _____

Comments: Spider in Cartridge to remove spider he used stick to have spider crawl onto it & remove him elsewhere

Arrival: 1033
Depart: 1040

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 6
Weather: P. Cloudy Temperature (°F): 40°F
Pressure (in. Hg) _____ Sample Index ID No. PI-00023
Sample Time: 1033-1040 Time at location Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin
MSI Personnel: Scott Adamson, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. 2M757

Sample Pump Previous Calibration? 10/8/08

Current Flow Rate: 2.0 L/min

Sample Calibration: ☒ Yes ☐ No

Flow Rate Adjusted? ☐ Yes ☒ No

Final Flow Rate: 2.0 L/min

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐ Other _____

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☒ Other: Logbook completed

Comments: _____

Arrival 1041
Depart: 1044

AMBIENT AIR AUDIT CHECKLIST

Date: 10/9/07 Station No.:A- 3
Weather: PC Cloudy Temperature (F): 45°F
Pressure (in. Hg) _____ Sample Index ID No. PI-00024
Sample Time: 1041-1044 TIME at Location Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin
MSI Personnel: Scott Adamson, Mike Peterson

Rotometer ID No.: RM-02

Rotometer Previous Calibration? 10/7/07

Sample Pump ID No. 24710

Sample Pump Previous Calibration? 10/8/07

Current Flow Rate: 2.0 L/MIN

Sample Calibration: ☒ Yes ☐No

Flow Rate Adjusted? ☐Yes ☒No

Final Flow Rate: 2.0 L/MIN

Sample Flow Rate: 2.0 (2.0 Liters/Minute)

Filter Type: ☒ 25mm, 0.8µm pore size ☐Other _____

Field Duplicate: ☐Yes ☒No Dup Index ID No. _____

Deviation from SOP AMB-LIBBY-OU3? ☒ No ☐Other

_____

FSDS Completed: ☒Yes ☐Other: Logbook Completed

Comments: _____

MINE WASTE AND SOIL AUDIT CHECKLIST

Date: 10/11/07 Station ID: MW-3 or MS-3
Weather: Sunny ~50
Inspector: C. O'Loughlin
Station Arrival Time: 1155
Team: MINE WASTE
Station Departure Time:
Team Members: Paula Butteler, Rebecca Wenner
GPS: N 0616300, E 5366-70 EL 899 meters
Accuracy ±9ft, Deviation N

Area: ☐ Mine High Wall ☐ Mine Pit ☐ Mine Dump ☒ Road ☐ Mill ☐ Bench
☐ Other

Material Type: ☐ Waste Rock ☐ Cover Material ☐ Outcrop ☒ Road Material ☐ Tails
☐ Other

Index ID No. PI-00372 Sample Time: 12:15

Sample Type: ☒ Grab ☐ Composite

Field Duplicate? ☒ Yes ☒ No Dup Index ID No. PI-00373

Sample Tool: ☒ Trowel ☐ Hand/Grab ☐ Other

Deviation from OU3 SOP No.1 & 2 (Rev #0)? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☐ Other:
Comments: Sample Pt. 2ft off of the right side of the road as one goes up to mile 3-4 on the mine Rd.
TAL-Metals + Boron, Mercury, TOC, Paste PH, Florde, TAL Phosphous, VOC-Petrol, Extractable VOC-Hydrocarbons, PCBs, Asbestos, (Archive Jar.)

MINE WASTE AND SOIL AUDIT CHECKLIST

Date: 10/15/07 Station ID: MS-29
Weather: Sunny 55°F
Inspector: C. O'Loughlin Station Arrival Time: 1100
Team: Mine Waste Team Station Departure Time: 1135
Team Members: Rebecca Wegner, Paula Bottcher
GPS: N 0617332, E 5365380, EL 1139 meters
Accuracy ±9ft, Deviation N/C

Area: ☐ Mine High Wall ☐ Mine Pit ☒ Mine Dump ☐ Road ☐ Mill ☐ Bench
☐ Other

Material Type: ☒ Waste Rock ☐ Cover Material ☐ Outcrop ☐ Road Material ☐ Tails
☐ Other

Index ID No. PI-00298 Sample Time: 1115

Sample Type: ☒ Grab ☐ Composite

Field Duplicate? ☐Yes ☒No Dup Index ID No.

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other Encore for Soils

Deviation from OU3 SOP No.1 & 2 (Rev #0)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: 1) Begin by labeling bottle/are. 2) Clear off big mine tailings. 3) Take 5 bottles + 1 ziplock bag, 1 Encore to be sampled. Take Picture + GPS. 4) leave. Location.

MINE WASTE AND SOIL AUDIT CHECKLIST

Date: 10/15/07 Station ID: MS-28

Weather: Sunny 55°F

Inspector: C. O'Loughlin Station Arrival Time: 1140

Team: MINE WASTE Team Station Departure Time: 1215

Team Members: Rebecca WENNER, Paula Butcher

GPS: N 0617206, E 5365343, EL 11259 meters

Accuracy ±9ft, Deviation ?

Area: ☐ Mine High Wall ☐ Mine Pit ☐ Mine Dump ☒ Road ☐ Mill ☒ Bench
☐ Other _____

Material Type: ☐ Waste Rock ☐ Cover Material ☐ Outcrop ☐ Road Material ☒ Tails
☐ Other _____

Index ID No. PI-00290 Sample Time: 1145

Sample Type: ☒ Grab ☐ Composite

Field Duplicate? ☒ Yes ☐ No Dup Index ID No. PI-00291

Sample Tool: ☒ Trowel ☒ Hand/Grab ☐ Other _____

Deviation from OU3 SOP No.1 & 2 (Rev #0)? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: _____

Comments: MINE Bench on a "Road" Overlook Carney Creek

MINE WASTE AND SOIL AUDIT CHECKLIST

Date: 10/15/07 Station ID: MS-27

Weather: Sunny 55°F

Inspector: C. Oatman

Station Arrival Time: ~~1230~~ 1220

Team: Mine Waste Team Station Departure Time: ~~1250~~ 1240

Team Members: Rebecca WENNER, Paula Butcher

GPS: N 0617078, E 5365359, EL 11271 meters

Accuracy ±9 ft, Deviation N

Area: ☐ Mine High Wall ☐ Mine Pit ☒ Mine Dump ☐ Road ☐ Mill ☒ Bench
☐ Other _____

Material Type: ☒ Waste Rock ☐ Cover Material ☐ Outcrop ☐ Road Material ☐ Tails
☐ Other _____

Index ID No. PI-00299 Sample Time: 1230

Sample Type: ☒ Grab ☐ Composite

Field Duplicate? ☐ Yes ☒ No Dup Index ID No. _____

Sample Tool: ☒ Trowel ☒ Hand/Grab ☐ Other Excel

Deviation from OU3 SOP No.1 & 2 (Rev #0)? ☒ No ☐ Other

_____

FSDS Completed: ☒ Yes ☐ Other: _____

Comments: Carney Creek Side of the Mine. Cleaned off sample location with trowel.

MINE WASTE AND SOIL AUDIT CHECKLIST

Date: 10/15/07 Station ID: MW-26

Weather: Sunny 60°F

Inspector: C. O'Loughlin Station Arrival Time: ~~1255~~ 1245

Team: Mine Waste Team Station Departure Time: 1309

Team Members: Rebecca WENNER, Paula Butcher

GPS: N 0616938, E 536539, EL 1120 meters

Accuracy ±12ft, Deviation X

Area: ☐ Mine High Wall ☐ Mine Pit ☐ Mine Dump ☐ Road ☐ Mill ☒ Bench
☐ Other _____

Material Type: ☒ Waste Rock ☐ Cover Material ☐ Outcrop ☐ Road Material ☐ Tails
☐ Other _____

Index ID No. P1-00292 Sample Time: 1250

Sample Type: ☒ Grab ☐ Composite

Field Duplicate? ☐Yes ☒No Dup Index ID No._____

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other_____

Deviation from OU3 SOP No.1 & 2 (Rev #0)? ☒No ☐Other

_____

FSDS Completed: ☒Yes ☐Other:_____

Comments: Remove failing pieces which are too large.

SURFACE WATER AND SOIL AUDIT CHECKLIST

Date: 10-15-07 Station ID: CCS-16

Weather: Clear, ≈ 50°F

Inspector: Mark Nelson Station Arrival Time: 10:15

Team: _____ Station Departure Time: 11:00

Team Members: _____

GPS: N 5364664, E 0618222, EL 1134 meters

Accuracy ± 9ft., Deviation 0

Area: ☐ Fleetwood Creek ☒ Carney Creek ☐ Rainy Creek ☐ Other _____

Type: ☐ Seep/Spring ☐ Stream ☐ Pond ☒ Other Sediment Sample at Spring

Index ID No. PI-00289 Sample Time: 10:40

Field Data Measurements Collected: ☐ Yes ☒ Other No field measurements - sediment sample only

Stream Discharge Measured? ☐ Yes Method: _____

☐ Other No

Field Duplicate: ☐ Yes ☒ No Dup Index ID No. _____

Equipment Decontaminated: ☐ Yes ☒ Other Equipment is dedicated

Deviation from OU3 SOP No.3, 4, and 5 (Rev #0)? ☒ No ☐ Other

_____

_____

FSDS Completed: ☒ Yes ☐ Other: _____

Comments: None

_____

_____

_____

SURFACE WATER AND SOIL AUDIT CHECKLIST

Date: 10-15-07 Station ID: MP - Mill Pond
Weather: Clear ~55° F
Inspector: Mark Nelson Station Arrival Time: 11:15
Team: Sediment Station Departure Time: 12:25
Team Members: Dennis Adams
GPS: N 5365869, E 0615941, EL _____ meters
Accuracy 9 ft., Deviation 4 ft. N

Area: ☐ Fleetwood Creek ☐ Carney Creek ☒ Rainy Creek ☐ Other _____

Type: ☐ Seep/Spring ☐ Stream ☒ Pond ☐ Other _____

Index ID No. PI-00348 Sample Time: 11:40

Field Data Measurements Collected: ☐Yes ☒Other No field measurements - sediment sample only

Stream Discharge Measured? ☐Yes Method: _____

☐Other N/A

Field Duplicate: ☒Yes ☐No Dup Index ID No. PI-00349

Equipment Decontaminated: ☐Yes ☒Other Dedicated Sample Equipment

Deviation from OU3 SOP No.3, 4, and 5 (Rev #0)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other: _____
Comments: None

SURFACE WATER AND SOIL AUDIT CHECKLIST

Date: 10/12/07 Station ID: CCS-6

Weather: P. Cloudy 45°F

Inspector: C. O'Loughlin CHO 10/12/07 Station Arrival Time: 0915 Part Mile 944 Arrive At Station

Team: Surface Water ~~Sediment~~ Station Departure Time: 1007

Team Members: Toby Leeson MATT Young

GPS: N 0614123 , E 536040 , EL 1027 meters

Accuracy ±12ft , Deviation X

Area: ☐ Fleetwood Creek ☒ Carney Creek ☐ Rainy Creek ☐ Other

Type: ☒ Seep/Spring ☐ Stream ☐ Pond ☒ Other Wetland Area

Index ID No. P1-00385 Sample Time: 0930

Field Data Measurements Collected: ☒ Yes ☐ Other

Stream Discharge Measured? ☐ Yes Method: No discharge - very little flow

☒ Other No flow can be collected here lots of standing H2O.

Field Duplicate: ☐ Yes ☒ No Dup Index ID No.

Equipment Decontaminated: ☒ Yes ☐ Other Dedicated tubing + equipment

Deviation from OU3 SOP No.3, 4, and 5 (Rev #0)? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☐ Other:

Comments: Just collecting surface H2O, use a geopump to collect water. Peristaltic Pump + PE tubing to collect H2O. Good sampling procedure. Watch preservatives make sure they don't come out. VOCs. Don't touch tubing to bottleware.

Just collect the aqueous samples. Another team will collect the sediments

SURFACE WATER AND ~~SOIL~~ AUDIT CHECKLIST

Date: 10/11/07-10/12/07 Station ID: CCS-8

Weather: P.Cloudy

Inspector: C. O'Callahan Station Arrival Time: 1045

Team: Surface H2O Team Station Departure Time: 1125

Team Members: Matt Young, Toby Leeson

GPS: N 0616968, E 0536507, EL 1029 meters

Accuracy ±18ft, Deviation Note the stake say CCS-7 + the GPS coordinates say CCS-8

Area: ☐ Fleetwood Creek ☒ Carney Creek ☐ Rainy Creek ☐ Other

Type: ☒ Seep/Spring ☐ Stream ☐ Pond ☐ Other

Index ID No. PI-00386 Sample Time: 1100

Field Data Measurements Collected: ☒ Yes ☐ Other

Stream Discharge Measured? ☐ Yes Method:

☒ Other The seeps are not flowing at a measurable rate.

Field Duplicate: ☐ Yes ☒ No Dup Index ID No.

Equipment Decontaminated: ☐ Yes ☒ Other All tubing + equipment is dedicated.

Deviation from OU3 SOP No.3, 4, and 5 (Rev #0)? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☐ Other:

Comments:

Another team will collect the sediments

SURFACE WATER AND ~~SOIL~~ AUDIT CHECKLIST

Date: ~~10/4/07~~ 10/12/07 Station ID: CCS-1

Weather: Sunny 50°F

Inspector: C. O'Loughlin Station Arrival Time: 1140

Team: Surface Water Station Departure Time:

Team Members:

GPS: N 0617293, E 5365173, EL 1053 meters

Accuracy 19ft, Deviation X

Area: ☐ Fleetwood Creek ☒ Carney Creek ☐ Rainy Creek ☐ Other

Type: ☒ Seep/Spring ☐ Stream ☐ Pond ☐ Other

Index ID No. P1-00382 Sample Time: 1200

Field Data Measurements Collected: ☒ Yes ☐ Other

Stream Discharge Measured? ☐ Yes Method:

☒ Other No, method Collect sample from standing seepage pools.

Field Duplicate: ☐ Yes ☒ No Dup Index ID No.

Equipment Decontaminated: ☐ Yes ☒ Other Dedicated Sampling Equipment

Deviation from OU3 SOP No.3, 4, and 5 (Rev #0)? ☒ No ☐ Other

NONE.

FSDS Completed: ☒ Yes ☐ Other:

Comments: Seep was a pool. The tubing was put in and it sucked up the water + came up the other side. Good protocol + methods. (10 bottles) 3 VOAs,

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/3/07 Transect: SL-15
Weather: Rain/Snow 33°F Station ID: SL 15 - 12
Team Color: Yellow Index ID No.:
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Sample Time: 1120 (1220) CHO 10/3/07
Team Members: JANE URBAN, Daniel Brookes, Rebecca Wenner

SOIL

Sample Media: ☐ Organic Debris Index ID No. PI-00046
☒ Soil Index ID No. PF 00046

Field Duplicate? ☐Yes ☒No Dup Index ID No. N/A

Sample Tool: ☐ Shovel ☒Trowel ☒Other Bleed Hand to Collect Organic Layer material.
☒Dedicated ☐Decontaminated

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐No ☐Other

They can only collect 4 pts instead of 5 pts because 1 pt is covered with rocks. They collected from 200° of the tree.

TREE BARK

Tree Bark Index ID No.: PI-00045

Field Duplicate? ☒No ☐Yes Dup Index ID No. N/A

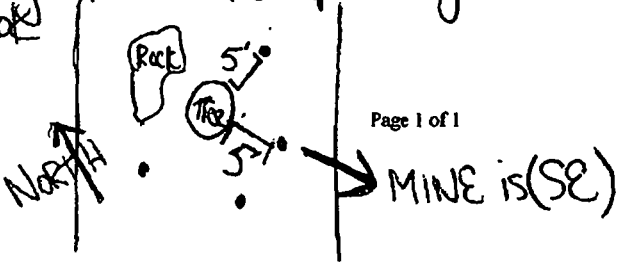
Core Sample: ☒No ☐Yes Core Sample ID No. N/A

Tree Flagged and Tagged: ☒Yes ☐No Tag #56 & Orange tape

Equipment Deconned: ☐Yes ☒No All equipment is dedicated.

Deviation from SOP TREE-LIBBY-OU3(Tree Bark)? ☒No ☐Other

FSDS Completed: ☐Yes ☐Other:
Comments: (GPS: N0619028 E5375438) Pine tree location. Accuracy = ±19ft Elevation: 1173 Meters 24" diameter Rebecca did the Sampling. Collection height 5.0ft. ID of the tree was good. The drilling/Collection of Sample was good. Collection of Soil samps was good took only 4 locations.



TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/3/07 Transect: 45
Weather: SUNNY/COOL Station ID: SL 45 - 08
Team Color: RED Index ID No.:
Inspector: ☒ C.T. Irwin ☐ C. O'Loughlin Sample Time: 15:25 SOIL
Team Members: BOYD BREEDING, JOAN KESTER, BRUCE ELOFF

SOIL

Sample Media: ☐ Organic Debris Index ID No. P1-00083
☑ Soil Index ID No. "

Field Duplicate? ☐Yes ☑No Dup Index ID No.

Sample Tool: ☐ Shovel ☑Trowel ☐Other ORG: HAND GRAB
☐Dedicated ☐Decontaminated

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☑No ☐Other

UTM N 0 62 1456
E 537 09 16
EL. 986 m +/-13 FT
~~130~~ 100 NW OF TARGET

TREE BARK

Tree Bark Index ID No.: P1-00082 15:09

Field Duplicate? ☑No ☐Yes Dup Index ID No.

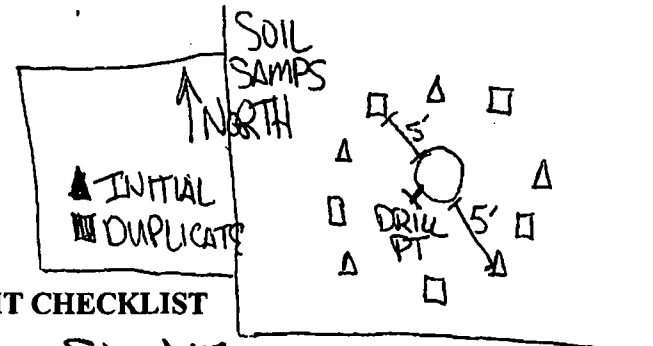
Core Sample: ☑No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☑Yes ☐No Tag #99

Equipment Deconned: ☐Yes ☐No N/A

Deviation from SOP TREE-LIBBY-OU3(Tree Bark)? ☑ No ☐Other

FSDS Completed: ☑Yes ☐Other:
Comments: ARRIVE 14:20
DEPART 15:35



TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/3/07 Transect: SL-45
Weather: P. Cloudy Station ID: SL 45 - 13
Team Color: Yellow Index ID No.:
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Sample Time: 1530
Team Members: JANE URBAN, Daniel BROOKES, REBECCA ~~WENNER~~ WENNER (CHO 10/3/07)

SOIL

Sample Media: ☒ Organic Debris Index ID No. PI-00093
☒ Soil Index ID No. PI-00093

Field Duplicate? ☒ Yes ☐ No Dup Index ID No. PI-00094

Sample Tool: ☐ Shovel ☒ Trowel ☒ Other Hand with Blade
☒ Dedicated ~~☐ Decontaminated~~ Dedicated Everything

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐ No ☐ Other

Used hand to Collect soil Duff/leaf litter.

TREE BARK

Tree Bark Index ID No.: PI-00091

Field Duplicate? ☐ No ☒ Yes Dup Index ID No. PI-00092

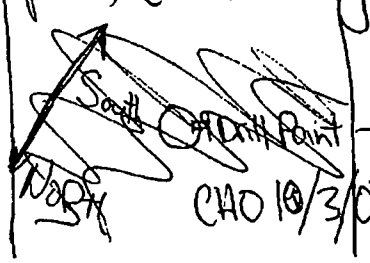
Core Sample: ☐ No ☐ Yes Core Sample ID No. N/A

Tree Flagged and Tagged: ☒ Yes ☐ No TAG # 50 Blue TAG + Aluminum Nail

Equipment Deconned: ☐ Yes ☒ No Dedicated Everything

Deviation from SOP TREE-LIBBY-OU3(Tree Bark)? ☒ No ☐ Other

FSDS Completed: ☐ Yes ☐ Other:
Comments: GPS: N 0625197 meters E 5369586.955 meters, Accuracy ±21ft. Rebecca is doing the sampling. Diameter 41" DF tree. Was Good, Hair Spray the Head Respirator on. Drill Pilot hole. Remove Bore with bottle opener, Collection height = 5ft.
PICTURE = 546



MINE IS (SW)

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/3/07 Transect: 45
Weather: SUNNY, COOL Station ID: SL 45 - 09
Team Color: RED Index ID No.:
Inspector: ☒ C.T. Irwin ☐ C. O'Loughlin Sample Time: 1332 (SOIL)
Team Members: Boyd Breeding, Kristen E. Loff

SOIL

Sample Media: ☑ Organic Debris Index ID No. P1-00081 ~~SA 1347~~
☑ Soil Index ID No. "

Field Duplicate? ☐Yes ☑No Dup Index ID No.

Sample Tool: ☐ Shovel ☑Trowel ☑Other HAND GRAB FOR ORGS
☐Dedicated ☐Decontaminated

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐No ☐Other

N. 062 1978 DEV. +/- 12 FT
E. 537 15 15 40 FT. SW OF TARGET
EL. 932 M

TREE BARK

Tree Bark Index ID No.: P1-00060 SAMPLED 13:17

Field Duplicate? ☑No ☐Yes Dup Index ID No.

Core Sample: ☑No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☐Yes ☐No TAG #81

Equipment Deconned: ☐Yes ☐No NA

Deviation from SOP TREE-LIBBY-OU3(Tree Bark)? ☐ No ☐Other

FSDS Completed: ☐Yes ☐Other:
Comments: ARRIVE 1300
DEPART ~~1335~~ 1345

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/3/07 Transect: 45
Weather: IN CLOUDS, PART SUN, COOL, RAIN Station ID: SL 45 - 12
Team Color: Red Index ID No.:
Inspector: X C.T. Irwin ☐ C. O'Loughlin Sample Time: 1127 (SOIL)
Team Members: Ryan Berning, Jean Kerica, Bruce Eloff

SOIL

Sample Media: ☑ Organic Debris Index ID No. P1-0059
☑ Soil Index ID No. P1-0059

Field Duplicate? ☐Yes ☑No Dup Index ID No.

Sample Tool: ☐ Shovel ☑Trowel ☑Other HAND RAKE ORGANICS
☑Dedicated ☐Decontaminated

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐No ☐Other

N 0 (23 51 (E 53 73 351 EL 1275M DEV. 10 FT.
130 ~~118~~ FT. S. OF ORIGINAL TARGET

TREE BARK

Tree Bark Index ID No.: P1-0057

Field Duplicate? ☑No ☐Yes Dup Index ID No.

Core Sample: ☑No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☑Yes ☐No Tag #96

Equipment Deconned: ☐Yes ☐No N/A

Deviation from SOP TREE-LIBBY-OU3(Tree Bark)? ☑No ☐Other

FSDS Completed: ☐Yes ☐Other:
Comments: ARRIVE ~ 11:00
DEPART ~ 1135

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/5/07 Transect: 315
Weather: SNOW, RAIN, COLD Station ID: SL 315 - 04
Team Color: GREEN Station Arrival Time: 1300
Inspector: ☒ C.T. Irwin ☐ C. O'Loughlin Station Departure Time: 1335
Team Members: NICOLE LINDSTRUM, SARAH ~~[illegible]~~ CALAWAY, KAITLIN BARKLOW
GPS: N 0614650, E 5368192, EL 1279 meters
Accuracy _____, Deviation _____

SOIL/ORGANIC DEBRIS

Index ID No. P1-000-152 Sample Time: 1327

Field Duplicate? ☐Yes ☑No Dup Index ID No. _____

Sample Tool: ☑Trowel ☑Hand/Grab ☐Other _____

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☑No ☐Other

_____

TREE BARK

Tree Bark Index ID No.: P1-000151 Sample Time: 1324

Field Duplicate? ☑No ☐Yes Dup Index ID No. _____

Core Sample: ☑No ☐Yes Core Sample ID No. _____

Tree Flagged and Tagged: ☑Yes ☐No _____ Tag Number 17

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☑No ☐Other

_____

FSDS Completed: ☑Yes ☐Other: _____

Comments: COLD, ICEY & SNOW CONDITIONS SLOWING PACE. DENSE VEGETATION.

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/5/07 Transect: 15
Weather: Snowing 29°F Station ID: SL 15 - 06
Team Color: Blue Station Arrival Time: 0910
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1010
Team Members: TT Dunnahoe, Trevor Heaton, Anthony Kaina
114
GPS: N 0621186 0682281 E 5368411 5310677 EL 1161 meters
Accuracy ±23 ft, Deviation (CHO 10/5/07)

SOIL/ORGANIC DEBRIS

Index ID No. PI-00122 Sample Time: (1004 Duff 1011 Soil)

Field Duplicate? ☒ Yes ☐ No Dup Index ID No. PI-00126

Sample Tool: ☒ Trowel ☒ Hand/Grab ☐ Other Collect Duff with gloved hand.

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐ No ☒ Other

Should change gloves between samples

TREE BARK

Tree Bark Index ID No.: PI-00121 Sample Time: (0945)

Field Duplicate? ☐ No ☒ Yes Dup Index ID No. PI-00125

Core Sample: ☒ No ☐ Yes Core Sample ID No. ———

Tree Flagged and Tagged: ☒ Yes ☐ No _____ Tag Number 39

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒ No ☐ Other

FSDS Completed: ☒ Yes ☐ Other: (Diameter 13") Difficult finding
Comments: a suitable tree to sample - a Douglas Fir. They had trouble finding one because of the altitude.

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/5/07 Transect: 45
Weather: Rainy 39°F Station ID: SL 45 - 16
Team Color: _____ Station Arrival Time: 1240
Inspector: ☐ C.T. Irwin ☐ C. O'Loughlin Station Departure Time: 1325
Team Members: TJ Dunnahoe, Trevor Heaton, Anthony Kania
GPS: N 0629458, E 5370463, EL 823 meters
Accuracy ±16 ft, Deviation N

11U

SOIL/ORGANIC DEBRIS

Index ID No. PI-00130 Sample Time: Duff = 1250 Soil = 1259

Field Duplicate? ☐Yes ☒No Dup Index ID No. _____

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other _____

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

Collect sample with gloved hand + did not change gloves between samples.

Change gloves according to OU3 SOP.

TREE BARK

Tree Bark Index ID No.: PI-00129 Sample Time: 1320

Field Duplicate? ☒No ☐Yes Dup Index ID No. _____

Core Sample: ☐No ☒Yes Core Sample ID No. 1310 PI-00129

Tree Flagged and Tagged: ☒Yes ☐No _____ Tag Number 42

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other: Diameter = 10.6"
Comments: _____

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/5/07 Transect: 75
Weather: Rain 40°F Station ID: SL 75 - 09
Team Color: Blue Station Arrival Time: 1100
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1200
Team Members: JT Dunnahoe, Trevor Heaton, Anthony Liana
GPS: N 0624186, E 536847, EL 816 meters
Accuracy ±20 ft, Deviation N/

1114

SOIL/ORGANIC DEBRIS

Index ID No. PI-00128 Sample Time: 1135 Duff 1142 Soil

Field Duplicate? ☐Yes ☒No Dup Index ID No. ———

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other used gloved hand to take the duff.

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No CHO 10/5/07 ☐Other ☒ Yes

Did not change gloves between samples.

TREE BARK

Tree Bark Index ID No.: PI-00127 Sample Time: 1120

Field Duplicate? ☒No ☐Yes Dup Index ID No. ———

Core Sample: ☒No ☐Yes Core Sample ID No. ———

Tree Flagged and Tagged: ☒Yes ☐No _____ Tag Number 29

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒ No ☐Other

FSDS Completed: ☒Yes ☐Other: Diameter 10.1"
Comments:

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/5/07 Transect: 195
Weather: Foggy -42°F Station ID: SL 195 - 08
Team Color: 501 Blue Station Arrival Time: 1505
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1600
Team Members: TJ Dunnabee, Trevor Heaton, Anthony Kiana
GPS: N 0616334, E 5359546, EL 1463 meters
Accuracy ±19ft, Deviation N

111U

SOIL/ORGANIC DEBRIS

Index ID No. PI-00162 Sample Time: Duff = 1528 Soil = 1536

Field Duplicate? ☐Yes ☒No Dup Index ID No. ——

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other
For Duff did not change glove between samples.

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PI-00161 Sample Time: 1515

Field Duplicate? ☒No ☐Yes Dup Index ID No. ——

Core Sample: ☐No ☒Yes Core Sample ID No. 1545 PI-00161

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 41

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other: Diameter = 8.15", Tree on BLM land.
Comments:

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/8/07 Transect: SL-195-06
Weather: Foggy 45°F Station ID: SL 195 - 06
Team Color: Yellow Station Arrival Time: 1115
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1230
Team Members: JJ Dunnahoe, Anthony Kiana, Daniel Brooks
GPS: N 0616585, E 5361170, EL 1009 meters
Accuracy ±19, Deviation N

SOIL/ORGANIC DEBRIS

Index ID No. P1-00115 Sample Time: 1125

Field Duplicate? ☒Yes ☐No Dup Index ID No. P1-00116

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other Gloved hand to collect Duff.

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☐No ☒Other

Should change gloves between samples for Soil Duplicate; only 4 pts were collected. 5pts were collected for initial sample. Tree obstruction stopped 5th sample.

TREE BARK

Tree Bark Index ID No.: P1-00113 Sample Time:

Field Duplicate? ☐No ☒Yes Dup Index ID No. P1-00114

Core Sample: ☒No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 69

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: Diameter of tree = 10.5"

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/8/07 Transect: 195
Weather: FOGGY, RAIN Station ID: SL 195 - 05
Team Color: ~~GREEN~~ RED Station Arrival Time: 1138
Inspector: ☒ C.T. Irwin ☐ C. O'Loughlin Station Departure Time: 1240
Team Members: BOYD BROWNING BRUCE ELDER JOAN KETTER
GPS: N 0616711 ~~5361968~~, E 5361968, EL 959 meters
Accuracy +/- 18 FT, Deviation 40' W OF TARGET

SOIL/ORGANIC DEBRIS

Index ID No. P1-00192 Sample Time: 1204

Field Duplicate? ☐Yes ☐No Dup Index ID No.

Sample Tool: ☑Trowel ☑Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☑No ☐Other

TREE BARK

Tree Bark Index ID No.: P1-00191 Sample Time: 1152

Field Duplicate? ☑No ☐Yes Dup Index ID No.

Core Sample: ☐No ☑Yes Core Sample ID No. P1-00191

Tree Flagged and Tagged: ☑Yes ☐No Tag Number 92

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☑ No ☐Other

FSDS Completed: ☑Yes ☐Other:
Comments:

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/2007 Transect: 255
Weather: PC Cloudy Station ID: SL 255 - 02
Team Color: Purple Station Arrival Time: ~~0750~~ 0750
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 0815
Team Members: Trevor + Jeremy
GPS: N 6158477, E 5365370, EL 831 meters
Accuracy ±20', Deviation X

SOIL/ORGANIC DEBRIS

Index ID No. PI-00214 Sample Time: 0820

Field Duplicate? ☐Yes ☒No Dup Index ID No. ———

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other _____

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

_____

TREE BARK

Tree Bark Index ID No.: PI-00213 Sample Time: 0810

Field Duplicate? ☒No ☐Yes Dup Index ID No. _____

Core Sample: ☒No ☐Yes Core Sample ID No. _____

Tree Flagged and Tagged: ☒Yes ☐No _____ Tag Number 9

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒No ☐Other

_____

FSDS Completed: ☒Yes ☐Other: _____
Comments: Diameter 8.4" Level C

_____

_____

_____

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/07 Transect: 315
Weather: P. Cloudy 49°F Station ID: SL 315 - 01
Team Color: Purple Station Arrival Time: 0815
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 0915
Team Members: Trevor + Teremy C.
GPS: N 0696742, E 536444, EL 1012 meters
Accuracy ±18ft, Deviation NC

SOIL/ORGANIC DEBRIS

Index ID No. PI-00216 Sample Time: 0910

Field Duplicate? ☐Yes ☒No Dup Index ID No. ~

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PI-00215 Sample Time: 0900

Field Duplicate? ☒No ☐Yes Dup Index ID No. ~

Core Sample: ☒No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☒Yes ☐No Tag Number

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: Diameter 19.8" (Level C)

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/2007 Transect: 315
Weather: Scattered Clouds 50° Station ID: SL 315 - 02
Team Color: Purple Station Arrival Time: 0951
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1020
Team Members: Trevor + Jeremy C.
GPS: N 0616453, E 5366966, EL 1002 meters
Accuracy ±10ft, Deviation N

SOIL/ORGANIC DEBRIS

Index ID No. PI-00218 Sample Time: 1010

Field Duplicate? ☐Yes ☒No Dup Index ID No. →

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PI-00217 Sample Time: 1000

Field Duplicate? ☒No ☐Yes Dup Index ID No.

Core Sample: ☒No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 98

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: Diameter = 19.2", Sample Technique good (Level C)

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/2007 Transect: 015
Weather: Sunny 50F Station ID: SL 015 - 02
Team Color: Purple Station Arrival Time: 1050
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1115
Team Members: Trevor + Jeremy
GPS: N 0617648, E 5367516, EL 973 meters
Accuracy ±10ft, Deviation X

SOIL/ORGANIC DEBRIS

Index ID No. ~~PI-00210~~ PI-00220 Sample Time: 1110

Field Duplicate? ☐Yes ☒No Dup Index ID No.

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PI-00219 Sample Time: 1100

Field Duplicate? ☒No ☐Yes Dup Index ID No.

Core Sample: ☒No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 44

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: Diameter = 11A" (Good) (Level C)

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/07 Transect: 045
Weather: Sunny 50F Station ID: SL 045 - 02
Team Color: Purple Station Arrival Time: 1131
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1155
Team Members: Trevor, Jeremy C.
GPS: N 0618384, E 5367170, EL 997 meters
Accuracy ±5ft, Deviation N/A

SOIL/ORGANIC DEBRIS

Index ID No. PI-00222 Sample Time: 1150

Field Duplicate? ☐Yes ☒No Dup Index ID No.

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PI-00221 Sample Time: 1140

Field Duplicate? ☒No ☐Yes Dup Index ID No.

Core Sample: ☒No ☐Yes Core Sample ID No.

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 89

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒ No ☐Other

FSDS Completed: ☒Yes ☐Other:
Comments: Diameter = 16.5" (Level C)

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/07 Transect: 015
Weather: Sunny 55°F Station ID: SL 015 - 03
Team Color: Purple Station Arrival Time: 1500
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1540 (1590)
Team Members: Trevor + Jeremy
GPS: N 0617775, E 5368303, EL 1097 meters
Accuracy ±17ft, Deviation X

SOIL/ORGANIC DEBRIS

Index ID No. PT-00224 Sample Time: 1520

Field Duplicate? ☐Yes ☒No Dup Index ID No. —

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PT-00223 Sample Time: 1510

Field Duplicate? ☒No ☐Yes Dup Index ID No. —

Core Sample: ☒No ☐Yes Core Sample ID No. —

Tree Flagged and Tagged: ☒Yes ☐No Tag Number 10

Deviation from SOP TREE-LIBBY-OU3 (Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other:

Comments: Diameter 12.1" (Level C)
Very Sparse Vegetation, only 1 tree which was good within 300ft of sample pt.

TREE BARK AND SOIL AUDIT CHECKLIST

Date: 10/11/07 Transect: 045
Weather: P. Cloudy 55°F Station ID: SL 045 - 03
Team Color: Purple Station Arrival Time: 1600
Inspector: ☐ C.T. Irwin ☒ C. O'Loughlin Station Departure Time: 1620
Team Members: Trevor + Teremy C.
GPS: N 0618801, E 5367750, EL 1092 meters
Accuracy ±18ft, Deviation N/A 380ft toward the mine Due to time+safety constraints.

SOIL/ORGANIC DEBRIS

Index ID No. PI-00226 Sample Time: 1620

Field Duplicate? ☐Yes ☒No Dup Index ID No. —

Sample Tool: ☒Trowel ☒Hand/Grab ☐Other —

Deviation from OU3 SOP No.1(Rev0) (Soil-NonVOCs)? ☒No ☐Other

TREE BARK

Tree Bark Index ID No.: PT-00225 Sample Time: 1610

Field Duplicate? ☒No ☐Yes Dup Index ID No. —

Core Sample: ☒No ☐Yes Core Sample ID No. —

Tree Flagged and Tagged: ☒Yes ☐No _____ Tag Number 27

Deviation from SOP TREE-LIBBY-OU3
(Tree Bark)? ☒No ☐Other

FSDS Completed: ☒Yes ☐Other: _____
Comments: Diameter 12.7"

ATTACHMENT C

DISCUSSION OF GIS AND GPS

Geographic Information System and Global Positioning System Details

Geographic Information System (GIS)

GIS is a collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. All mapping for the OU3 Phase #1 was performed using Arcmap 9.2. Arcmap 9.2 is GIS software developed by ESRI. Shapefiles are geographically represented points, polygons, and polylines. Shapefiles were provided by the United States Forest Service (USFS), State of Montana Department of Environmental Quality (MDEQ), NewFields, and MWH. All shapefiles are displayed in the Universal Transverse Mercator (UTM) coordinate system. UTM coordinate system is a grid-based (zones) method of specifying locations on the surface of the Earth. The OU#3 area is part of UTM zone 11N. All data are presented and recorded in meters. Sample location (node) coordinates were provided by EPA in the Montana State Plane NAD83 coordinate system. The nodes and other shapefiles provided to MWH in any other coordinate system than UTM were converted to UTM using ArcCatalog.

As sampling was performed, each team noted the location on the FSDS and created a waypoint on the GPS unit. The waypoints were imported into the Mapsource Trip & Waypoint Manager, converted to a comma-separated values (csv) file, and finally converted to a shapefile. This was most important for the tree bark and soil sampling event, considering the sample locations provided by EPA may not have been feasible due to safety, access, and tree species availability. This was an important aspect of the on-site sampling of mine waste and sediment. Mine waste sample locations with the exception of MS-04 through MS-09 were physically identified with wooden stakes and flagging. MS-04 through MS-09 were composite samples composed of eight sample sitess along an elevation transect to be determined by MWH. Each transect sample location was physically identified with wooden stakes and flagging and a waypoint was created. Sediment sample locations were identical to the surface water sample locations; however the sample locations provided by EPA may not have been feasible due to sediment availability.

Geographic Positioning Systems (GPS)

Garmin eTrex VistaHC GPS units were used for all aspects of the OU3 Phase I RI. Features of the Garmin eTrex VistaHC include: accuracy of less than three meters in ideal conditions, electronic compass, expandable memory, waterproof (allowing the units to be decontaminated prior to leaving the site), interaction between GPS units and computer through Mapsource Trip & Waypoint Manager. The Mapsource software is very similar to Arcmap and enabled MWH to create custom maps for each GPS unit, which allowed each GPS unit to be updated as the project progressed. This was most important for the tree bark and soil sampling event considering the remote nature of the sample locations and number of sampling teams in the field. Updating each GPS unit created a safer work environment by communicating access routes and illustrating team locations. Updating the GPS units eliminated the possibility of collecting two samples at one location.

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1062186

SITE NAME: LIBBY ASBESTOS

DOCUMENT DATE: 12/07/2007

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☑ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
  (Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

1 - CD PHASE I REMEDIAL INVESTIGATION FIELD SAMPLING SUMMARY REPORT, OU3, APPENDICES

Contact the Superfund Records Center to view available document.
(303) 312-6473

TARGET SHEET

EPA REGION VIII

SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1062186

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DOCUMENT DESCRIPTION:

PLATE 3-1 MINE WASTE AND SOIL SAMPLE LOCATIONS
PLATE 4-1 SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS
PLATE 5-1 WELL LOCATIONS
PLATE 6-1 TREE BARK AND FOREST FLOOR SAMPLE LOCATIONS
PLATE 7-1 AMBIENT AIR SAMPLE LOCATIONS

Contact the Superfund Records Center to view available document.
(303) 312-6473